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CROP ESTIMATING AND REPORTING SERVICES OF THE DEPARTMENT OF AGRICULTURE

REPORT AND RECOMMENDATIONS

OF A

SPECIAL SUBCOMMITTEE

OF THE

COMMITTEE ON AGRICULTURE

OF THE

HOUSE OF REPRESENTATIVES

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LETTER OF TRANSMITTAL

CONGRESS OF THE UNITED STATES,
HOUSE OF REPRESENTATIVES,
Washington, D. C., June 16, 1952.

Hon. HAROLD D. COOLEY,
Chairman, Committee on Agriculture,
House of Representatives.

DEAR MR. CHAIRMAN: Transmitted herewith is the report of your special subcommittee appointed to study the cotton crop estimates of 1951 and related estimates, forecasts, and reports of the Crop Reporting Board of the Department of Agriculture.

Is it the conclusion of your subcommittee that a large part of the overestimate of the 1951 cotton crop, which caused a serious break in the price of cotton and resulted in millions of dollars of loss to cotton farmers, could and should have been avoided. The subcommittee suggests herein a number of steps which it believes will improve the Board's operations and methods and thereby increase the accuracy of its forecasts and help to prevent a recurrence of the 1951 experience.

Several of the recommendations made by the subcommittee will take some additional appropriation and the subcommittee hopes that the Bureau of Agricultural Economics will take cognizance of this in preparing its next budget and that it will receive the support of members of Congress for those improvements which are deemed to be a good investment.

It is possible that some changes in the laws relating to the gathering, making and issuing of crop forecasts and reports might be found desirable. Your subcommittee believes that the proper time to consider this subject will be at the start of the next Congress, after the members of the full committee, officials of the Bureau, and others interested have had an opportunity to study this report and discuss any proposed changes in the law.

In conclusion, your subcommittee wants to point out that this extensive study and investigation, which has continued over a period of several months, has been carried out without one cent of extra expense to the committee. The very considerable amount of research involved and the detailed work of preparing this report have been done by the regular committee counsel, John J. Heimburger, in direct collaboration with the subcommittee members and chairman, and without the employment of any extra personnel.

Our subcommittee desires to specially commend our counsel, Mr. Heimburger, who has been of great assistance during the course of our hearings and the preparation of this report. A considerable part of the data which the subcommittee had available to it and on which its report is based is the result of individual research done by him.

Respectfully submitted.

THOS. G. ABERNETHY,
Chairman, Special Subcommittee.

FOREWORD

On July 9, 1951 the Crop Reporting Board of the Bureau of Agricultural Economics, United States Department of Agriculture, issued a report estimating cotton acreage in cultivation on July 1, 1951, at 29,510,000 acres—58.5 percent above the 1950 acreage and 33.1 percent above the 1940–49 average. On August 8, 1951, the Board issued its first estimate of cotton production for 1951 and forecast a crop of 17,266,000 bales—7,254,000 more than the previous year and 5,263,000 bales above the 10-year average. The production estimate was raised to 17,291,000 bales in September, was reduced 360,000 bales in October and, finally, in November was reduced another 1,160,000 bales to a forecast of 15,771,000 bales—which, it turned out, was still 641,000 bales above the final (May 8, 1952) estimate of 1951 cotton production.

The cotton market reacted in a normal manner to this official prediction of a tremendous cotton crop for 1951 from the Government agency charged by law with the responsibility of making such predictions. The market fell off sharply with the announcement of the estimated acreage in cultivation July 1, and continued at a relatively low level during August and September in keeping with the estimate of more than 17,000,000 bales in the Board's reports for those months. It showed some upward trend in October when the forecast was slightly reduced, but resumed a level more in relationship with the actual supply and demand situation only after the issuance of the November estimate which made a much more realistic forecast of crop prospects.

Mistake costly to farmers

The net result of this price weakness created by the Board's erroneous estimate of a cotton surplus was that farmers lost more money in 1951 from the action of the Crop Reporting Board than they did from the inroads of either insects, floods, or bad weather.

This wide margin of apparent error in estimating the 1951 cotton crop, and its financially disastrous results to farmers, brought to a head scattered rumblings of dissatisfaction over various reports and estimates of the Crop Reporting Board and led the committee to undertake a study of the Board's methods and procedures. Although the hearing was confined almost entirely to estimates relating to cotton acreage and production, the discussion herein will apply equally well to most other major crop reports, for the same general techniques are used throughout.

Immediately upon the appointment of the subcommittee designated to make the study, the opening of hearings was announced and the committee issued through the press a general invitation for anyone who had an interest in the matter to appear. It also issued specific invitations to a number of individuals and groups who had voiced criticism of the Board's reports or who, the committee felt, might be in a position to offer constructive criticism or suggestions as to the improvement of those reports. It received a very small response to

this general and widely publicized invitation for witnesses to appear at the hearings. Apparently, while a great many people have been dissatisfied from time to time at some of the reports issued by the Crop Reporting Board, there is a considerable reluctance on their part to come in and suggest how the reports might be improved.

Committee sought comments

When the anticipated throng of witnesses with suggestions for improving the crop reports failed to materialize, the committee instructed its counsel to seek suggestions, recommendations, and comments from groups and individuals who might be presumed to be informed on this subject and to have information of value to the committee in its study. Letters were directed to a number of heads of college departments of agricultural economics, and others, and the letters received in reply thereto are printed in full in the appendix to this report.

The committee has not undertaken to criticize, classify, or comment on the proposals and suggestions made in these letters and statements. It believes that the authors of the statements and letters should be heard in their own right and that their proposals and comments should receive the careful study and consideration of all who are interested in improving our official crop estimates and reports.

The subcommittee held one open hearing and then, because it was discussing a technical matter of little interest to the casual committee-room spectator, and because it felt that its information could much more readily be obtained under the procedure of a round-table discussion than in the usual formal committee manner of hearing one witness at a time, the committee conducted the remainder of the study in a series of closed meetings with officials of the Crop Reporting Board and the Bureau of Agricultural Economics, the transcripts of which are printed fully in the hearings.

The members of the subcommittee which studied this matter do not pose as experts on sampling surveys, statistics, or crop reports. Rather than trying to become experts on this subject and issue a report in which the technical advantages of certain statistical methods, as compared to others, have been thoroughly analyzed and classified, the committee felt that it would be much more beneficial for it to go thoroughly into the methods and procedures used by the Board on a nontechnical basis and to make its report accordingly.

The report which follows, therefore, does not presume to make a concise series of hard and fast recommendations which the committee finds will improve the crop reporting service, although it will make some very specific recommendations which the committee believes will be of value. In the main, the report will be a general discussion of the details of the methods and procedures now used by the Board, with observations and suggestions by the committee which it believes are at least worthy of consideration by the Bureau of Agricultural Economics and by all those who are interested in improving the crop reporting service.

The committee hopes that this report will be read and used by those who are experts on this subject and technically competent to make specific suggestions for improving the methods and techniques of crop reporting. It believes that if the report is used in this manner it will be of considerable service in actually bringing about improvement in this important field of statistical reports.

CROP ESTIMATING AND REPORTING SERVICES OF THE DEPARTMENT OF AGRICULTURE

A Brief History of the Crop Reporting Service

The crop and livestock reporting work carried on by the Bureau of Agricultural Economics of the United States Department of Agriculture is older than the Department itself. Over a century ago farmers began to realize that they were at a disadvantage when bargaining because they knew less about crop and livestock supplies than did the people to whom they sold. The first attempt to improve the farmer's bargaining position by increasing his knowledge of crop conditions took place in 1839, when Congress authorized the Patent Office to spend $1,000 for the distribution of seeds and the collection of agricultural statistics.

Sixteen years later, in 1855, James T. Earle, president of the Maryland Agricultural Society, being dissatisfied with the results obtained in the collection of agricultural statistics by the Patent Office, tried to collect information concerning crops through State agricultural societies, and advocated collection of such information by an "Agricultural Department of the General Government. Mr. Earle's efforts were not very successful so far as the immediate collection of statistics was concerned, but they had considerable effect in keeping the desirability of systematic crop reports before the agricultural public.

Seven years later, in 1862, Orange Judd, editor, American Agriculturist, collected monthly crop reports from his subscribers and published the results. So far as available records show, the efforts of these two men, Earle and Judd, were the first systematic efforts in the United States to obtain prompt and reliable crop reports.

The continued recommendations of the Commissioner of Patents that the agricultural work be separated from that of the Patent Office, together with the growing demand for information concerning crop production, and the demonstration by the American Agriculturist that systematic crop reports were feasible, apparently contributed to the establishment of the United States Department of Agriculture in 1862 with a provision that the Commissioner of Agriculture should—

> acquire and preserve all information concerning agriculture, which he can obtain by means of books, correspondence, and by practical scientific experiments (accurate records of which experiments shall be kept in his office), by the collection of statistics, and by any other appropriate means within his power.

Continuous series of statistics

Although monthly and bimonthly reports on condition of crops were published by the Commissioner of Agriculture beginning in 1863, the year 1866 marks the real beginning of a continuous series of agricultural statistics under the direction of the United States Department

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of Agriculture. About 1900, crop specialists and regional field agents were appointed for personal field observation and inquiry and in 1905 the Crop Reporting Board was organized. Although annual reports had been made on prices of farm products, the monthly collection of prices was not begun until 1908, and in 1912 the Crop Reporting Board began to forecast production of important crops prior to harvest. From that time on, a continuous series of agricultural estimates on acreage, yield, and production of all important crops and data on the major species of livestock have been available.

At present, the Crop and Livestock Reporting Service maintains 41 field offices, one in each State except Delaware, which is handled in combination with the office at Maryland; Nevada, which is combined with Utah; and the six New England States, which are handled from one office at Boston. Over 500 reports are issued each year, about 2 reports per working day. The information covers almost every phase of the agricultural business. By and large the basic data on crop acreage and production, livestock numbers, and similar data are collected through voluntary reports by farmers. More than a half million farmers cooperate in this work each year, for which they receive no compensation other than the reports and information provided them in return by the Bureau. In addition to the farmers, the Bureau of Agricultural Economics has the voluntary cooperation of more than 200,000 business firms such as mills, elevators, ginners, banks, merchants, and so forth, who report on prices, volume of operations, and other matters that are necessary and a definite part of the information provided by this reporting service.

Cotton Crop Estimates

Each year during the growing and harvesting season the board makes three estimates of cotton acreage and five estimates of cotton production. The timing and number of these reports are specifically provided by law. In the case of most crops, a report of farmers' intentions to plant is issued about the middle of March and reports of acres planted to the various crops are made in subsequent months. In the case of cotton, however, the law specifically prohibits the issuance of any report as to farmers' planting intentions or any report of acres planted prior to July 1.

The first official report of cotton acreage is the report issued about the 8th of July which shows the estimated number of acres in cultivation on July 1. This estimate is a key factor in the production estimates which are issued monthly beginning in August, for the acreage figures used in the July report of acres planted are not revised again until December 1. For its December 1 report, the Board obtains new acreage reports from the farmers and on the basis of these, and other information which may have become available in the meantime, revises its estimate of acres in cultivation on July 1. For the intervening four monthly estimates of cotton production, however, the unrevised July 1 acreage estimate has been the official basis for computation.

The only modification in the July estimate of acres planted that is made prior to the December 1 revision of that figure, is the modifica-

tion due to abandonment after July 1, which is estimated as of September 1.

Production estimates

Estimates of cotton production for each current year are made pursuant to law as of the first of each month beginning in August. In making the August estimates of production, the board relies entirely on the reports it receives from farmers. The acreage figures used in arriving at the August estimate of production are the estimates of acres in cultivation on July 1, as reported in July, reduced by the 10-year average abandonment for each State.

Similarly, the September report of cotton production is based entirely on reports received from farmers. In this case, however, the schedule which is mailed out to crop reporters asks for a report of acres abandoned since July 1, so that acreage figures which take into account the estimated actual abandonment since July 1 are available for the September 1 report on production.

The same acreage figures used in September are used again without any modification whatever for the October and November estimates of production. Farmers are not asked to report again on abandonment in these two months. Beginning in October, however, a new source of information is available, the reports from ginners, required by law to be submitted to the Bureau of the Census showing the number of bales ginned and the number estimated by the ginner still to be ginned in his area. These reports are made available promptly to the Crop Reporting Board and from October onward are available as an additional source of information.

For its December report of production, the Board uses revised acreage figures. It not only requests farmers to report on their December schedules the acreage abandoned since July 1, but sends out new acreage schedules from which it revises its July 1 estimate of acres in cultivation. The December acreage estimate, therefore, not only reflects new abandonment figures, but also any revision that may appear to be required in the original July estimate of acres in cultivation.

Estimating procedure

A few days before a crop estimate, schedules or questionnaires are mailed out to farm-crop reporters (and any others who may be included in the list for any special reason) by the office of the State statistician of the Bureau of Agricultural Economics. These reports are mailed back to the State statistician's office by the crop reporters and as they come in they are examined for completeness and "reasonableness." The employees of the State statistician's office presumably exercise their judgment at this point by throwing out as "unreasonable" any return which appears to be seriously out of line with the others.

As soon as the deadline for handling that particular estimate in the State statistician's office has been reached, district and State tabulations are made of the information on the usable schedules received from crop reporters up to that time.

The State statistician then analyzes the data which has been tabulated and this data is recorded on forms provided for that purpose and sent to the Crop Reporting Board in Washington.

In Washington, the State summary reports are analyzed by the Crop Reporting Board, which is composed of at least five statisticians and the Chairman. At least two of the Board members will be from the Washington office and three from the field offices who are called in to work on that particular report.

Each Board member makes a separate and independent appraisal of all the information provided by each State statistician, including any comments and special indications which the State statistician may have transmitted. The estimates arrived at for each State by each of the Board members individually are then tabulated on a special form for review by the Chairman and adoption.

The final estimating procedure is conducted in great secrecy in locked quarters, and no one is permitted to leave the quarters until the Secretary of Agriculture or the Acting Secretary has come into the room, approved the report, and takes it out with him at the hour designated for its release.

1951 Cotton Estimates

In reviewing the estimates of cotton acreage for 1951 it is apparent that for various reasons, some of which will be discussed later, the acreage in cultivation on July 1 was seriously overestimated. The original July 1 estimate of acreage in cultivation was 29,510,000 acres. When the Board sent out its new schedules and reviewed this estimate on December 1, it revised its July acreage estimate downward by 1,513,000 acres, a little more than 5 percent. Remembering that this December 1 figure of acres in cultivation (27,997,000) is what the Board decided on December 1 should have been its July estimate of acres in cultivation, it is clear that this is one factor which played an important part in the extremely high September estimate of cotton production. Even after subtracting its estimated abandonment during July and August from the July 1 figures of cotton in cultivation, the Board used an acreage figure of 28,544,000 in computing its September production estimate—547,000 acres more than the Board decided in December was actually in cultivation on July 1.

There is no doubt that the 1951 estimate of acreage in cultivation was seriously out of line not only with the actual number of acres of cotton which were in cultivation on that date, but also with the accuracy of July 1 acreage estimates for the past several years. Over the past 15 years, the difference between the original July 1 estimate of acres in cultivation and the December 1 revision of that estimate has been only 1.3 percent. In 1951, in contrast, there was an error of 5.4 percent in the July 1 estimate.

The following table shows, by States, the various acreage estimates for the 1951 cotton crop.

TABLE 1.—*1951 cotton acreage estimates, by States and for the United States*

[In thousands of acres]

State	Acreage in cultivation—				Acreage harvested—		
	July 1 estimate	Dec. 1		Final (May 1952)	Sept. 1 estimate [1]	Dec. 1 estimate	Final (May 1952)
		Estimate	Increase or decrease from July				
			Percent				
Missouri	560	570	+2	570	493	490	490
Virginia	23	21	−9	19	22	21	19
North Carolina	775	701	−10	698	763	690	690
South Carolina	1,170	1,051	−10	1,075	1,163	1,045	1,070
Georgia	1,470	1,414	−4	1,424	1,452	1,400	1,410
Florida	69	66	−4	63	68	65	62
Tennessee	855	812	−3	805	813	775	765
Alabama	1,575	1,470	−7	1,469	1,566	1,460	1,460
Mississippi	2,625	2,453	−7	2,463	2,533	2,330	2,340
Arkansas	2,350	2,262	−4	2,189	2,251	2,070	2,025
Louisiana	1,000	934	−7	949	986	920	935
Oklahoma	1,675	1,551	−7	1,561	1,600	1,450	1,475
Texas	13,125	12,486	−5	12,407	12,600	11,800	11,750
New Mexico	338	327	−3	328	330	320	315
Arizona	560	558	0	548	557	555	545
California	1,341	1,302	−3	1,331	1,329	1,290	1,320
Minor States [2]	19	19	0	18	18	17	16
United States	29,510	27,997	−5.1	27,917	28,544	26,698	26,687

[1] July estimate of acreage in cultivation July 1 less September estimate of abandonment.
[2] Illinois, Kansas, Kentucky, and Nevada.

Source: U. S. Department of Agriculture, Bureau of Agricultural Economics, Crop Reporting Board, June 13, 1952.

As the result of this error in acreage, and other factors which are discussed later in this report, the estimates of cotton production issued in August and September were almost fantastically high. They were reduced somewhat in October, and brought down sharply in November and again in December. The December estimate of 15,290,000 bales was quite close to the final estimate of 15,130,000 bales made in May of this year.

The following table gives detailed comparisons of the crop estimates for 1951 with the past experience of the Board in making such estimates:

TABLE II.—*United States cotton production: Comparison of forecasts and final ginnings in 500-pound gross weight bales*

Year	Aug. 1 [1]		Sept. 1 [1]			Oct. 1 [1]			Nov. 1 [1]			Dec. 1			Final ginnings, thousand bales
	Thousand bales	Percent of final	Thousand bales	Percent of previous month	Percent of final	Thousand bales	Percent of previous month	Percent of final	Thousand bales	Percent of previous month	Percent of final	Thousand bales	Percent of previous month	Percent of final	
1915	11,876	106.1	11,697	98	104.5	10,960	94	97.8				11,161		99.7	11,192
1916	12,916	112.8	11,800	91	103.1	11,637	99	101.6				11,511		100.5	11,450
1917	11,949	105.7	12,499	105	110.6	12,047	96	106.6				10,949		96.9	11,302
1918	13,619	113.1	11,137	82	92.5	11,818	106	98.1				11,700		97.2	12,041
1919	11,016	96.5	11,230	102	98.3	10,696	95	93.7				11,030		96.6	11,421
1920	12,519	93.1	12,783	102	95.1	12,123	95	90.2				12,987		96.6	13,440
1921	8,203	103.1	7,037	86	88.5	6,537	93	82.2				8,340		104.9	7,954
1922	11,447	117.3	10,575	92	108.3	10,135	96	103.8				9,964		102.1	9,762
1923	11,517	113.6	10,788	94	106.4	11,015	102	108.6	10,248	93	101.1	10,081	98	99.4	10,140
1924	12,351	90.6	12,787	104	93.8	12,499	98	91.7	12,816	103	94.0	13,153	103	96.5	13,628
1925	13,566	84.2	13,740	101	85.3	14,759	107	91.6	15,386	104	95.5	15,603	101	96.9	16,104
1926	15,621	86.9	15,166	97	84.4	16,627	110	92.5	17,918	108	99.7	18,618	104	103.6	17,977
1927	13,492	104.1	12,692	94	98.0	12,678	100	97.9	12,842	101	99.1	12,789	100	98.7	12,956
1928	14,291	98.7	14,439	101	99.7	13,993	97	96.7	14,133	101	97.6	14,373	102	99.3	14,478
1929	15,543	104.8	14,825	95	100.0	14,915	101	100.6	15,009	101	101.2	14,919	99	100.6	14,825
1930	14,362	103.1	14,340	100	102.9	14,486	101	104.0	14,438	100	103.6	14,243	99	102.2	13,932
1931	15,584	91.2	15,685	101	91.7	16,284	104	95.3	16,903	104	98.9	16,918	100	99.0	17,096
1932	11,306	87.0	11,310	100	87.0	11,425	101	87.9	11,947	105	91.9	12,727	107	97.9	13,002
1933	12,314	94.4	12,414	101	95.1	12,885	104	98.8	13,100	102	100.4	13,177	101	101.0	13,047
1934	9,195	95.4	9,252	101	96.0	9,443	102	98.0	9,634	102	100.0	9,731	101	101.0	9,637
1935	11,798	110.9	11,489	97	108.0	11,464	100	107.8	11,141	97	104.7	10,734	96	100.9	10,638
1936	12,481	100.7	11,121	89	89.7	11,609	104	93.6	12,400	107	100.0	12,407	100	100.1	12,399
1937	15,593	82.3	16,098	103	85.0	17,573	109	92.8	18,243	104	96.3	18,746	103	98.9	18,945
1938	11,988	100.4	11,825	99	99.0	12,212	103	102.2	12,137	99	101.6	12,008	99	100.5	11,944
1939	11,412	96.6	12,380	108	104.8	11,928	96	100.9	11,845	99	100.2	11,792	100	99.8	11,816
1940	11,429	91.0	12,772	112	101.6	12,741	100	101.4	12,847	101	102.2	12,686	99	101.0	12,565
1941	10,817	100.7	10,710	99	99.7	11,061	103	103.0	11,020	100	102.6	10,976	100	102.2	10,742
1942	13,085	102.1	14,028	107	109.4	13,818	99	107.8	13,329	96	103.9	12,982	97	101.3	12,820
1943	12,558	109.9	11,679	93	102.2	11,478	98	100.4	11,442	100	100.1	11,478	100	100.4	11,429
1944	11,022	90.1	11,483	104	93.9	11,953	104	97.7	12,320	103	100.7	12,359	100	101.1	12,230
1945	10,134	112.4	10,026	99	111.2	9,779	98	108.5	9,368	96	103.9	9,195	98	102.0	9,016
1946	9,290	107.5	9,171	99	106.1	8,724	95	101.0	8,487	97	98.2	8,482	100	98.2	8,640
1947	11,844	99.9	11,849	100	99.9	11,508	97	97.0	11,505	100	97.0	11,694	102	98.6	11,859
1948	15,169	102.0	15,219	100	102.3	15,079	99	101.4	15,166	101	101.9	14,937	98	100.4	14,877
1949	14,805	91.8	14,943	101	92.7	15,446	103	95.8	15,524	101	96.3	16,034	103	99.4	16,128
1950	10,308	103.0	9,882	96	98.7	9,869	100	98.6	9,945	101	99.3	9,884	99	98.7	10,012
1951	17,266	114.1	17,291	100	114.3	16,931	98	111.9	15,771	93	104.2	15,290	97	101.1	15,130

[1] From 1915 to 1923 inclusive, report related to 25th of preceding month.

1951 estimates far out of line

Study of the table discloses a number of interesting facts. In general it will be observed, as might be anticipated, that the estimates tend to conform more closely to the final estimated ginnings as they progress from month to month. While the average deviation between the August estimate and the final ginning figure is 6.5 percent for the past 20 years, the average deviation between the December production estimate and the final figure is only 1.1 percent for the same period. In 1951, the August estimate was 14.1 percent over the final estimate published on May 8, 1952, and the December estimate was 1 percent high.

Not since 1937, when the August estimate of cotton production was only 82.3 percent of the final estimate, has there been a deviation between the August and final estimates of production as great as that which occurred in 1951. On only two previous occasions since 1915 has there been a deviation this large—17.3 percent in 1922 and 15.8 percent in 1925. On the other hand, it will be noted that there have been many years in which the deviation between the August forecast and the final figure has been relatively high—too high, in the estimate of the committee. Since 1940 there have been 5 years in which the difference was 9 percent or more, 7 years in which it was 7 percent or more, and in contrast 5 years when it was 3 percent or less.

In the 37-year period for which comparative data are presented in the table, it will be noted that the forecast for August has shown less than 4 percent deviation from the final estimate in only 12 years. In 8 years the deviation has been between 4 and 8 percent, in 7 years between 8 and 12 percent, and in 10 years more than 12 percent

In considering the difference between the August forecast of cotton production and that which is eventually accepted as the correct final figure, it is easy—particularly because there was an apparent and admitted error in the 1951 forecast—to assume that all of the deviation in any year between the August forecast and the final estimate of production is error. This, of course, is not the case. The August production forecast is made, as are all the monthly forecasts in production, in anticipation of normal growing and harvesting weather for the balance of the crop year. One of the purposes of these monthly forecasts is to reflect the effect of weather conditions on crop prospects. To some extent, therefore, the deviation between the August forecast of production and the final estimates for any year reflect growing conditions, including insect infestation and other crop damage, which may be better or worse than usual for that particular year. At this time there is little possibility and little to be gained in trying to analyze the figures of previous years to determine what portion of deviation in the August estimate was due to growing conditions and what was due to error. The committee will be satisfied if it can point out some of the things which caused the deviation in the 1951 crop estimate.

Error persisted longer

Another interesting fact to be observed from table II is that the deviation or error in the 1951 estimates persisted longer than in most years. In the 10 years previous to 1951, the average deviation between the August production estimate and the final figure was 5.58 percent. By September sufficient adjustments had been made to reduce the

deviation to an average of 4.63 percent. In 1951, however, the September estimate went even further astray than the August estimate and was 14.3 percent above the final figure.

Turning to the October forecast of cotton production, the failure to adjust the estimate to the realities of the situation is even more apparent. For the previous 10 years, the average variation between the October estimate and the final figure was only 3.3 percent. In 1951, however, the overestimation of the crop was carried over through September and into October and was not substantially adjusted until the November crop report. The October estimate was still 11.9 percent above the final figure, an October variation exceeded only twice before in the history of cotton crop reports—in 1921 and 1932.

One of the most interesting facts presented by this table is that the tremendous reduction in the November 1951 estimate (1,160,000 bales below October) was the largest reduction in estimate which has ever been made in that month by the Crop Reporting Board. This amounted to a 7 percent drop below the estimate of the previous month. There has been no year since 1923, when November estimates of production were first made, that there has been so large a percentage reduction from the October to the November estimate as occurred in 1951.

Largest estimate in history

Another interesting fact is that 1951 was the first year in the history of cotton crop estimating that the Board predicted in August a crop in excess of 17 million bales. Some members of the committee felt that this fact alone should have given the Board occasion to stop and reconsider its figures.

One encouraging fact to be derived from these tables, but not readily apparent without close analysis, is that while variations of 10 percent or more between the August estimate and the final figures are not uncommon, the over-all trend of the variation in the August figures is improving. If a series of overlapping 10-year averages of variation between the August estimates and final figures is computed, it will be found that the average accuracy of these estimates has improved. Following are the average figures of variations between the August estimates and the final crop figures for the years indicated:

	Percent		*Percent*
1915–24	9. 15	1935–44	6. 47
1920–29	8. 94	1940–49	6. 18
1925–34	7. 42	1945–49	6. 04
1930–39	6. 82		

A most discouraging thing to the committee about the situation was the attitude of the Crop Reporting Board toward the variations and errors which have occurred from year to year and which seem likely to occur, unless there is considerable improvement, at any time in the future. The attitude of the members of the Board who appeared before the committee and worked very cooperatively with it was that these variations and errors are just "one of those things" about which very little can be done. Their attitude was almost the oriental philosophy of accepting placidly and without resistance the vagaries of fate which at times beset humanity and make a mockery of the best laid plans. While admitting that a high percentage of error in the crop forecast may have serious economic results, while regretting that these wide variations had occurred in the past, they figuratively shrugged

their shoulders and held out no real hope that similar variations and errors would not occur in the future.

Effect on Farmers

The Department's estimates of production of cotton and other crops have become a very important factor in the marketing and pricing of those crops. Prices react almost immediately to Department estimates of production and the effect of the high estimates of cotton production in 1951 are shown clearly by table III.

Table III.—*Crop estimates, ginnings, reported spot sales and prices for Middling 15/16-inch cotton in 10 spot markets (season 1951–52)*

Date	Crop estimate	Ginnings	Reported spot sales (weekly)		Middling 15/16-inch 10-market average Friday
			1950	1951	
		Bales	*Bales*	*Bales*	*Bales*
July 6			49,300	31,100	44.37
July 9	29,510,000 (acres in cultivation).				43.69
July 13			106,300	40,300	40.82
July 20			122,300	27,100	37.93
July 27			192,500	39,900	36.82
Aug. 3			360,900	46,800	35.20
Aug. 8	17,266,000 bales				34.94
Aug. 10			354,900	73,600	35.25
Aug. 17			237,100	120,600	34.96
Aug. 24		538,000	189,200	143,800	35.05
Aug. 31			176,300	199,000	34.32
Sept. 7			243,100	181,900	34.32
Sept. 10	17,291,000 bales	2,014,000			34.22
Sept. 14			263,100	245,300	34.56
Sept. 21		3,601,000	327,700	220,600	35.29
Sept. 28			398,500	302,400	36.32
Oct. 5			400,100	316,700	36.53
Oct. 8	16,931,000 bales	1,468,000			36.87
Oct. 12			258,200	357,100	36.42
Oct. 19			315,400	412,700	36.63
Oct. 25		8,389,000			37.08
Oct. 26			375,400	390,500	37.53
Nov. 2			364,200	458,200	38.94
Nov. 8	15,771,000 bales	10,022,000			41.45
Nov. 9			244,300	354,100	43.43
Nov. 16			347,100	400,100	41.67
Nov. 23		11,113,000	253,600	266,100	42.02
Nov. 30			247,000	464,700	43.16
Dec. 7			179,600	414,200	43.35
Dec. 10	15,290,000 bales	12,803,000			42.85
Dec. 14			167,400	289,200	41.49
Dec. 21		13,554,000	220,700	202,600	41.78
Dec. 28			92,100	86,700	41.84
Jan. 4			136,200	104,600	41.97
Jan. 11			223,900	225,100	42.40
Jan. 18			181,300	242,500	41.37
Jan. 25		14,508,000	178,900	192,100	41.75
Feb. 1				145,600	41.93

Following the small crop of cotton in 1950 of just over 10,000,000 bales, the price of cotton went up to the ceiling price of a little more than 45 cents per pound and remained there almost constantly until publication of the Department's estimate of acreage in cultivation on July first. In the four business days in July prior to the release of the report, the average price for Middling 15/16-inch cotton at the ten spot markets was 44.79 cents per pound, just a fraction of a cent under the ceiling. On July 9 the Crop Reporting Board released its estimate of 29,510,000 acres in cultivation on July 1, the largest acreage since 1937. In anticipation of the tremendous crop that this acreage would produce, the cotton market immediately broke. By the end

of that week it was down to 40.82 cents and it continued to drift steadily lower to 36.21 cents on the last day of July, 9.04 cents below the price on the last market day of June.

On August 7, the day before the first estimate of production was released, the average spot price was 35.08 cents per pound. The release of the Department's high estimate of a crop of 17,266,000 bales did nothing to encourage the market and it continued to drift generally slightly lower during August, winding up at 34.32 cents per pound on August 31.

When the September report estimated an even higher crop of 17,291,000 bales, the market continued in a relatively stagnant condition at about 35 cents. It went up gradually toward the end of the month to 36.31 cents per pound, as outside estimates began to throw some doubt on the high production forecast made by the Crop Reporting Board. When the October production forecast reduced the estimate by 360,000 bales, the market continued a slightly firmer tone. It remained at a little under 37 cents throughout most of October, but climbed gradually in the last few days and moved up to 38.20 cents on the last day of the month. When the November report came out, reducing the estimate of the crop by 1,160,000 bales, there was an immediate reaction in the market that sent the price well above 40 cents, where it has remained since that time.

High estimate cost farmers $125,000,000

It is obvious that the high estimates of cotton acreage and production had a most serious effect on the market, as far as cotton producers were concerned, and without doubt deprived many farmers of a price for their cotton which was in keeping with actual supply and demand conditions and comparable prices of other commodities. It would appear from a study of the price data that it would not be unfair to conclude that the false anticipation of a tremendously large cotton crop depressed the cotton market by an average of at least 5 cents per pound during the months of July, August, September, and October. From the table above, it will be seen that almost 10,000,000 bales of the 1951 crop of cotton were ginned during these 4 months and that 3,422,400 bales of cotton actually were sold on the 10 spot markets during this period. Farmers do not sell their cotton directly on the spot markets, but instead sell to ginners or cotton dealers who later resell the cotton. It is reasonable to assume, therefore, that if 10,000,000 bales had been ginned prior to November 1, and almost 3½ million bales had actually moved out of the ginners' or dealers' hands and through the spot markets, considerably more cotton than that, probably at least half of that which had been ginned—5,000,000 bales—had actually been sold by the farmer producers. If those farmers received 5 cents per pound less for their cotton than they should have received, this amounts to $25 per bale, or a total of $125,000,000 for 5,000,000 bales of cotton, which the committee believes it is reasonable to assume farmers would have received except for the Board's erroneously high estimates of cotton acreage and production.

Crop Reporters

It seems axiomatic to the committee that no compilation of statistics can be any more accurate than the original data from which those statistics are compiled or calculated. Applying this general principle to the Department's crop reports, it would seem that the

reports and estimates themselves could not be any more accurate than the basic information provided by farm reporters and used by the Crop Reporting Board in making its estimates. The officials of the Board who appeared before the committee seemed to believe, however, that their estimates are more accurate than the basic information obtained from their crop reporters. How the Board thinks it can produce over-all statistics that are more accurate than the basic data used to arrive at those statistics, is still somewhat of a mystery to the committee, but it apparently involves a profound faith in and extensive use of various sheets of graph paper covered with dots which are called regression charts. More about these regression charts later.

In spite of the Board's unshaken faith in the almost magic ability of its regression charts to account for errors, inaccuracy, and bias (or just plain misrepresentation) in the information it receives from farmers, the committee is not able fully to share this faith. It is convinced of the truth of at least the negative of the general statement made above, to wit: that the accuracy and value of the periodic crop estimates and reports made by the Board would be improved if the accuracy and reliability of the original information upon which its reports are based could be improved. The committee believes this basic data can and should be improved.

As has been pointed out above in some detail, the basic information used by the Board in making its estimates of cotton acreage and production comes from only two sources: (1) reports from farmers themselves, made on schedules mailed out or distributed by the Crop Reporting Service and filled in and returned by farmers; (2) reports from cotton ginners filed with the Bureau of Census pursuant to law. The July estimate of cotton acreage (which is the only acreage figure available for computing production for the months August, September, October, and November) is obtained entirely from the reports of farmer crop reporters. The estimates of abandonment of cotton acreage which are used in adjusting the acreage figure in September are also based entirely upon farmer reports. Reports from ginners as to the outturn of cotton are not available to the Board until October, and, therefore, the critically important production estimates of August and September are based entirely upon information provided by farmers.

Some ability required of crop reporters

A certain degree of intelligence and acumen is required of a farmer crop reporter. He is asked not only such specific questions as how much of each individual crop he has planted for various purposes this year and in previous years, but also how much fertilizer he and his neighbors have applied per acre, the average value of that fertilizer, how much cotton or other crops he thinks his neighbors have planted this year, what the production per acre is going to be on his own farm and in his neighborhood, the condition of the crops in his area (based on a definition of "normal" that would confuse many a college student), the percentage of infestation of boll weevil and other insects in his area, what effect he thinks this will have on the outturn of the crop, and similar questions that call for the exercise of a rather high degree of observation and judgment.

Two examples of the forms sent out by the Crop Reporting Board to be filled in and returned by their farm reporters are reproduced below.

Budget Bureau No. 40–R100.2.
Approval expires Dec. 31, 195*

C. 2-9753] "N" **JUNE 1951 ACREAGE SURVEY** S. C., (

I ORT FOR THE FARM OR PLANTATION YOU ARE OPERATING

CROP	Acres for harvest this year (1951)	Acres harvested last year (1950)	
1. **Corn** grown **alone**			1
2. **Corn** grown with soybeans, cowpeas, velvet beans, peanuts, etc.			2
3. **Wheat** for grain			3
4. **Oats** for grain (include oats cut ripe for feeding unthreshed)			4
5. **Barley** for grain			5
6. **Rye** for grain			6
7. **Sweet sorghum cane** for sirup			7
8. **Sorghums** for all other purposes			8
9. **Sugarcane**			9
10. **Irish potatoes (early)** for harvest before Sept. 1			10
11. **Irish potatoes (late)** for harvest after Sept. 1			11
12. **Sweetpotatoes and yams**			12
13. **Tobacco**			13
14. **Cotton**			14
15. **Soybeans** grown **alone** for beans			15
16. **Soybeans** grown **alone** for hay and other purposes			16
17. **Soybeans** grown with corn or other crops			17
18. **Cowpeas** grown **alone** for all purposes			18
19. **Cowpeas** grown with corn or other crops			19
20. **Peanuts** grown **alone**			20
21. **Peanuts** grown with corn or other crops			21
22. **Cowpeas** for hay (this may include all or part of the acreages shown under items 18 and 19.)			22
23. **Alfalfa** for hay			23
24. **Lespedeza** for hay			24
25. **Grains for hay** (wheat, oats, rye, etc.)			25
26. **All other hay** except peanut hay			26
27. **Velvetbeans** grown for all purposes (alone and with corn or other crops)			27
28. Other crops (Names of crops)			28
	1951	1950	
29. **ACRES OF ALL LAND IN THIS FARM OR PLANTATION.** (Include land rented from others)			29

Name .....

Post office ..... R. .....

County ..... State .....
(In which farm is located)

[OVER]

16—51924-9

(This form, filled in by 7,000 crop reporters scattered through the entire Cotton Belt, was the basic information on which the September 1951 cotton estimate was made:)

[C. E. 3 ··]

UNITED STATES D··A··MENT OF AGRICULTURE
BUREAU OF AGRICULTUR.. EC..OMICS—AGRICULTURAL ESTIMATES
WASHINGTON, D. C.

··et Bureau No. 40-R113.3.
val expires Dec. 31, 1951.

[SEPTEMBER 1, 1951]

SEPTEMBER 1 COTTON SCHEDULE

Name .....

Post office ..... *R. D. No.* .....

County (in which farm is located) .....

State .....

DEAR SIR:

Please mail this schedule promptly by September 1, in the enclosed envelope, WHICH REQUIRES NO POSTAGE. Your cooperation in furnishing the requested information will be appreciated. **Please read carefully the instructions below before making the report.**

INSTRUCTIONS TO REPORTERS

CONDITION OF COTTON (Item 1)

1 A **"normal" or "full" yield,** represented by 100 percent condition, is that yield per acre which is expected when the season is favorable and insects and diseases have caused little or no damage.

"Normal" (100 percent condition) is higher than that of most seasons but may be exceeded in an unusually favorable year. If the present condition is 10 percent above normal, the answer should be filled in as 110; if 5 percent below normal, it should be reported as 95, etc. In estimating the condition of cotton, consider not only the growth and appearance of plants, but also all other factors which influence the probable yield per acre.

2 Do **not** include under **abandoned area** any that may have been planted early and abandoned before July 1, the date when the estimate of acreage in cultivation was made. Include under "abandoned" only that part of the area which has not yielded and will not yield any cotton this year. (See item 2.)

Respectfully,

B. H. Mansell

Chairman, Crop Reporting Board.

RETURN THIS SCHEDULE EVEN THOUGH YOU CAN REPORT FOR ONLY ONE OR TWO ITEMS

REPORT FOR YOUR IMMEDIATE LOCALITY

(1)	(2)	(3)	Probable yield per acre in your locality this season		(6)	
			(4)	(5)		
Condition of cotton September 1, as compared with **normal.** (See instruction 1.)	Of cotton acreage under cultivation on July 1, what percentage has been **abandoned to date?** (See instruction 2.)	How many **bolls** per plant are **safe to date** this year?	**Seed cotton**	**Lint cotton**	**Boll weevils** Considering complete infestation as 100%, what would you estimate the **present infestation** in your locality?	
Percent	*Percent*	*Number*	**Pounds**	**Pounds**	*Percent*	

U. S. GOVERNMENT PRINTING OFFICE 16—80798-6

USE BACK OF SCHEDULE FOR COMMENTS

The committee implies no disrespect whatever for the farmers of this country when it expresses the opinion that there are many successful, prosperous farmers in the United States who are not equipped by education and training to answer these questions and fill out these forms in an accurate manner. It believes that there must also be many farmers who are equipped to answer the forms with reasonable accuracy but who will not devote the time and trouble either to fill out and return the form at all, or to do it with the exercise of judgment and care which should be devoted to it. The failure of a reporter who has received one of these forms to return it at all is probably not too serious; but the filling-in and returning of a form which contains anything less than the best and most accurate information on the subject, for any reason, seems to the committee to be a matter of very considerable importance in the compilation of crop reports and estimates, and one to which the Crop Reporting Board should have given more serious attention than apparently has been the case.

The farm crop reporters upon which our agricultural statistics depend so greatly are unpaid volunteers who are sent forms and schedules periodically by the Crop Reporting Service with the request that they be filled out and returned. The manner in which reporters are selected still remains something of a mystery to the committee, although it was discussed with officials of the Board several times during the course of the hearings.

Apparently there is no uniformity throughout the various States in the method of selecting farm-crop reporters or compiling the lists of farmers who are to be considered in this category, and to whom questionnaires and schedules are to be mailed. The mere lack of uniformity among the various States should imply, of course, no criticism whatever. Better lists may be obtained by different means in different States. When the committee finds, however, that there is an unmistakable lack of uniformity in the apparent caliber and ability of the crop reporters in various States, or in the nature of the lists themselves, it does consider this to be a serious matter and one which should have received more attention from the Crop Reporting Service than it has.

Five out of twelve good lists

In order to get some idea of the people the Board is depending upon for its basic crop data, the committee selected at random one county in each of several major cotton States and obtained from the Crop Reporting Service the names of the crop reporters in that county. It then obtained from sources within the county more or less detailed information about the qualifications of each of the persons on the crop-reporting list for that county. The results were somewhat startling.

It found that included among the persons on whom the Board is depending for crop information were people such as professional wrestlers, city and State employees not engaged in farming, haberdashers, automobile agency bookkeepers, and similar "authorities" on agricultural production. Out of the 12 county lists of crop reporters obtained and investigated by the committee, 5 appeared to be good, or reasonably good, lists. Out of one county list of about 70 reporters, for example, only 3 were not farmers and 2 were not residents

of the county. Most of the remainder appeared to be engaged in farming in some manner or other, either as owner or operator, and apparently capable of understanding and making farm-crop reports.

In another county list of about 30 reporters, all but 6 were judged by a person well acquainted with farmers in the county to be capable of acting as crop reporters.

The remaining seven lists are, in the opinion of the committee, not good lists. They show frequent instances of persons not residing in the county, deceased, not farming, or whose names are inaccurate—all indicating to the committee a lack of sufficient attention on the part of the State statistician in getting a part reporter list and keeping it up to date.

In one such county, for example, out of about 50 reporters there was 1 who had been dead for some time, 3 who were not farming, and 2 who had moved away from the area. About three-fifths of the reporters on this list were white and the remainder colored.

Many nonfarmers on lists

In one of the worst county lists investigated by the committee, out of about 30 listed as reporters the county agricultural offices have no record of 9 or know that they are not farming, 1 moved out of the State 2 years ago, 7 of those who are farming grow no cotton, and 6 grow very little cotton (10 acres or less). This is in an area of heavy cotton production where most farms will have considerably more than 10 acres of cotton. Only five persons on this list were farmers growing a substantial amount of cotton and apparently capable of making a significant cotton report.

Another county list of about 25 names showed 15 who were known to grow no cotton or of whom the county agricultural offices had no record, 1 who had moved away, 3 who historically produced 10 acres or less of cotton, and 7 who appeared to be capable reporters. Another county list of about the same size was divided almost 50–50 between persons who had no record of cotton production, or otherwise appeared to be unqualified as cotton crop reporters, and those who apparently were so qualified. Another county list of about 15 reporters also showed only about 50 percent being judged reasonably capable of serving as crop reporters.

Another list of about 40 reporters showed 5 who had moved away or never resided in the county, 9 who neither own nor operate a farm, 11 growing little or no cotton, 3 wrong names, and 2 wrong addresses. Included on this list were a haberdasher, a professional wrestler, and a florist.

From the practical standpoint of doing the job assigned to the crop reporters, it must be recognized that a certain amount of education and familiarity with reports and technical terms is almost essential to accurate reporting. In most of the seven lists which the committee does not consider to be good crop reporter lists, the percentage of those apparently without such a background is quite high—in some of them over 50 percent. It would certainly improve the farm reports if the Board leaned more heavily on farmers it knows or has reason to assume might have a broader educational background.

Percentage of returns small

Indicative, it seems to the committee, of the general condition of the crop reporter lists is the fact that the Crop Reporting Service receives

back from its farm reporters in usable condition and in time to be used, only about one out of every five questionnaires it sends out. Presumably these crop reporter lists are being constantly revised by the State agricultural statistician who is responsible for them, so that only active crop reporters—those who return enough forms to indicate a real interest—are retained on the lists. If this is the case, it seems to the committee that an average return of only about 20 percent is far too low.

It may be that the percentage of those who fill out the questionnaires and return them is immaterial, so long as the number of returns is sufficiently great to provide a satisfactory sampling basis for the estimates. On the other hand, there is certainly a very considerable waste of time and money in sending out, for example, 71,000 questionnaires and receiving back somewhat less than 12,000 replies, as was the case in the July cotton schedule of 1951. Also, the September estimate of cotton production might have been somewhat more accurate if most of the 29,000 crop reporters who received the September questionnaire had filled the form out and returned it, instead of the only 7,000 who actually did so.

TABLE IV.—*Number of schedules mailed and tabulated for use in estimating 1951 cotton acreage and production*

Report	Number of schedules mailed	Number of schedules tabulated
1. July acreage report:		
(a) June acreage schedule	130,727	31,980
(b) July cotton schedule	71,194	11,766
(c) Special supplemental list survey	[1] 110,000	28,500
2. August report: (a) August cotton schedule	32,854	7,268
3. September report: (a) September cotton schedule	29,319	7,033
4. October report:		
(a) October cotton schedule	28,570	7,045
(b) October ginners' reports	[2] 8,658	5,555
5. November report:		
(a) November cotton schedule	26,795	7,112
(b) November ginners' reports	[2] 8,658	5,496
6. December report:		
(a) December cotton schedules	66,084	11,569
(b) December ginners' reports	[2] 8,658	5,603
(c) Acreage and production survey	117,750	23,085
(d) Rural carrier survey	254,138	69,195
(e) Special supplemental list survey	92,225	12,756
7. May report: (a) End of season cotton schedule [3]	33,059	7,894

[1] Partly estimated for number mailed.
[2] Total number of gins.
[3] 1950 season.

Source: U. S. Department of Agriculture, Bureau of Agricultural Economics.

It seems to the committee that the job of reporting data as important to farmers and to the national economy as are the statistics on our major agricultural crops, is one which many farmers with the interest and education necessary to fill out such forms with a high degree of accuracy might be quite willing and eager to undertake. In other words it seems to the committee that the job of a farm crop reporter is and should be one in which the farmer selected for that purpose might take considerable pride. Although the job is conducted entirely on a voluntary basis (that is, without compensation) it appears that the Crop Reporting Service has never made any substantial

effort to obtain actual volunteers for this purpose or to permit farmers who are really interested to volunteer their services.

On the other hand, virtually all of the crop reporter lists appear to have been compiled in the office of the State agricultural statistician from lists of farmers picked up at random from various sources, in many cases without consultation with anyone familiar with the farmers on the list and apparently without any effort whatever to determine individual qualifications. In some States, it was said, there is a considerable degree of collaboration between the State statistician and county agents or other informed persons in the selection of names for the crop reporter lists. The committee suspects, but has not sought to verify, that the better county lists among those it checked were obtained in this manner, while those which are inferior were probably obtained by merely picking names at random off of a county PMA list or some other similar listing.

Better selection of reporters would help

The officials of the Crop Reporting Service admitted that some effort at selectivity, some personal contact with the crop reporters, and some effort to make these reporters feel the responsibility and the honor of their task, had proven from their experience to be quite beneficial. They pointed out, quite properly, that personal contact with the reporters is an expensive thing and that it can be carried on only to a very limited extent. The committee agrees with this and believes that the improvement which might be anticipated as a result of personal contact between a representative of the Bureau and each individual crop reporter would probably not be worth the very considerable expense it would entail.

The committee believes, however, that a number of things not involving actual personal contact between an employee of the Bureau and the crop reporters, and not necessarily entailing any great extra expense, could be done to improve the crop reporter lists. It seems quite clear to the committee, for example, that some of these crop reporter lists could be improved by the mere process of removing more quickly from the lists those who are not responding to the questionnaires or who are not returning satisfactory questionnaires, and substituting other names in their places—thus arriving by process of elimination at a reporter list which would at least return a high percentage of usable schedules.

It also seems to the committee that fruitful results might be obtained from an open campaign to obtain actual volunteers for this job. County newspapers, local radio stations, or some of the regular mailings of PMA committees and other Department of Agriculture agencies might be used to publicize the need for crop reporters in a locality and to invite those interested in helping out in this important work to volunteer their services. The committee is certain that the present list could be improved in many cases by closer collaboration with county agents and other informed persons in the locality, in an effort to obtain well-qualified reporters. This would, of course, possibly entail some additional travel and expense on the part of the State statistician's office.

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The committee believes that methods of obtaining information from farm-crop reporters other than that presently employed (distributing questionnaires chiefly through the mails and waiting for farmers to reply) might be explored. As one example of the possibilities in this direction, it was suggested that in counties where there is a county-wide telephone exchange, the county agent, the county PMA office, or some other regular employee of the Department of Agriculture in that county, might be provided with a list of the county crop reporters and the information desired from them with instructions to contact the reporters by telephone and obtain the desired information. This has never been tried and was not regarded with favor by the officials of the Bureau because among other reasons it involved the use of paid departmental employees outside the Bureau of Agricultural Economics.

Recommendations

The committee is convinced that the accuracy of crop estimates and reports will be improved if the accuracy, responsiveness, and reliability of the original information received from farm crop reporters is improved. It believes that the Bureau of Agricultural Economics has in the past devoted too little attention and too little imagination to the selection and improvement of its crop reporter lists. It believes that substantial improvement in these lists, in the percentage of response to questionnaires, and in the reliability and usefulness of the information received, may be achieved without any appreciable additional expenditure. It recommends specifically in this connection:

(1) Immediate and continued careful attention to and revision of crop reporter lists in the offices of the various State agricultural statisticians, with a view to eliminating from those lists reporters who fail to respond to questionnaires or who do not provide information with reasonable accuracy, and the constant addition of new and carefully selected names so as to have lists which will provide a high percentage of usable returns from each questionnaire sent out.

(2) Greater collaboration of State statisticians with county agents and other informed local persons in the selection of crop reporters who are equipped to provide the information desired.

(3) A serious trial of the use of local publicity and promotion methods to obtain as crop reporters competent and interested farmers who will actually volunteer their services in this respect.

(4) Consideration of various alternative means, including telephone contact, of obtaining the desired information from crop reporters.

The Basic Information

The second important factor affecting the accuracy and usefulness of the information obtained from crop reporters is the schedule or questionnaire which the reporter is asked to fill out. In this connection, it seems unlikely to the committee that the information received is going to be any better or more accurate than that which is requested. To put it another way, it appears to the committee that—particularly when questions are being directed to amateur, volunteer informants of unknown educational background—the type of infor-

mation requested and the manner in which the questions are asked will have a very considerable bearing on the accuracy and value of the replies.

The committee believes it is a sound principle that the questions asked in any such sampling survey should be so simple and direct as to be readily understandable to any person receiving the questionnaire, and so clear in meaning that they cannot easily be subject to more than one interpretation. It also believes that it is sound statistical theory that the basic data obtained in a sampling survey should be as direct, simple, explicit, and factual as possible and should call for the least possible exercise of judgment or estimation on the part of the person being questioned. Let's put it this way: If a farmer receives a questionnaire asking the one simple question, "What time is it when you fill out this questionnaire?" The chances are the replies received would be highly accurate. If instead, the questionnaire asks, "What time was it when you finished milking yesterday?" the replies would doubtless contain a considerable variation from factual accuracy. If still a third questionnaire asked, "At what average point chronologically did your most contiguous neighbor complete the operation of milking last week?" you would not care to bet much on the accuracy of the answers provided.

In the opinion of the committee, some of the questions asked by the Crop Reporting Board in the schedules sent to farmers may with justification be compared to the third question posed above. As examples of some of these questionnaires, there are reproduced below the July cotton schedule and the August 1 cotton schedule used by the Bureau in obtaining information for estimates of cotton production in 1951.

[C. E. 3-11]

UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF A[illegible]L ECONOMICS
AGRICULTURAL ESTIMATES
WASHINGTON 25, D. C.

Budget Bureau No. 40-R078.4.
Approval expires May 31, 1952.

[JULY 1, 1951]

JULY COTTON SCHEDULE

Name .....

Post office ..... *R. D. No.* .....

County (where farm is located) .....

State .....

DEAR SIR:

An estimate of this year's **cotton acreage** will be released in July. Your cooperation in supplying the information requested about the cotton crop will be of great assistance in preparing this cotton report. A return envelope, **which requires no stamp,** is enclosed for your convenience in returning the schedule.

Respectfully,

Chairman, Crop Reporting Board.

RETURN THIS SCHEDULE EVEN THOUGH YOU CAN REPORT FOR ONLY ONE OR TWO ITEMS

REPORT FOR YOUR FARM ONLY					REPORT FOR YOUR LOCALITY			
(1)	(2)	(3)	(4)	(5)	(6)	COMMERCIAL FERTILIZER (both mixed and unmixed) being used on cotton this year		
						(7)	(8)	(9)
Total acres of all land in your farm or plantation	Cotton on your farm or plantation now	Cotton on your farm or plantation a year ago	Cotton harvested on your farm or plantation season of 1950	Pounds of **cottonseed** used this year for planting the acreage reported in column 2 (including replanting)	What was the average **date that cotton was up to a stand** this year?	Proportion of the cotton acreage receiving fertilizer this year	Total pounds applied **per acre** where used (total of all applications)	**Average value per ton** of fertilizer used
Acres	*ACTUAL ACRES*	*ACTUAL ACRES*	*ACTUAL ACRES*	**Pounds**	Date	Percent	**Pounds**	Dollars

GOVERNMENT PRINTING OFFICE 16—53110-5

USE BACK OF SCHEDULE FOR COMMENTS

[C. E. 8-1]

UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF AGRICULTURAL ECONOMICS—AGRICULTURAL ESTIMATES
WASHINGTON, D. C.

Bureau No. 40-R116.2.
Approval expires Dec. 31, 1951.

C

AUGUST 1 COTTON SCHEDULE

[AUGUST 1, 1951]

Name .....

Post office ..... *R. D. No.* .....

County (in which farm is located) .....

State .....

DEAR SIR:

Please mail this schedule promptly by August 1, in the enclosed envelope, WHICH REQUIRES NO POSTAGE. Your cooperation in furnishing the requested information will be appreciated. **Please read carefully the instruction below before making the report.**

INSTRUCTION TO REPORTERS

CONDITION OF COTTON (Item 1)

A **"normal"** or **"full" yield,** represented by **100 percent condition,** is that yield per acre which is expected when the season is favorable and insects and diseases have caused little or no damage.

"Normal" (100 percent condition) is higher than that of most seasons but may be exceeded in an unusually favorable year. If the present condition is 10 percent above normal, the answer should be filled in as 110; if 5 percent below normal, it should be reported as 95, etc. In estimating the condition of cotton, consider not only the growth and appearance of plants, but also all other factors which influence the probable yield per acre.

Respectfully,

A. B. Hassell

Chairman, Crop Reporting Board.

RETURN THIS SCHEDULE EVEN THOUGH YOU CAN REPORT FOR ONLY ONE OR TWO ITEMS

REPORT FOR YOUR IMMEDIATE LOCALITY

(1) **Condition** of cotton Aug. 1, as compared with **normal.** (See instruction)	(2) How many **bolls** per plant are **safe to mature** this year? (If none yet safe, write "None")	(3) What is the percentage of a full or perfect stand this season? (Let 100 percent equal a perfect stand)	**Probable yield per acre** in your locality this season		(6) On what date were the first **bolls open** this year? (If not yet open, note the fact and give probable date)	(7) **Boll weevils** Considering complete infestation as 100%, what would you estimate the **present infestation** in your locality?	
			(4) **Seed cotton**	(5) **Lint cotton**			
Percent	*Number*	*Percent*	*Pounds*	*Pounds*	*Date*	*Percent*	

U. S. GOVERNMENT PRINTING OFFICE 16—53330-5

USE BACK OF SCHEDULE FOR COMMENTS

Referring first to the July cotton schedule, the following comments may be made:

The schedule is reasonably simple. Columns 1 through 5 ask for information about the farmer's own farm or plantation—information which he should have and be able to report with a reasonable degree of accuracy. Likewise, the questions are direct and factual and, with the exception of question 5, simple and not easily susceptible of more than one interpretation. In the case of question 5, however, it would seem to be unnecessarily complicated by referring to "the acreage reported in column 2" instead of "the cotton planted on your farm or plantation this year."

Referring to questions 6, 7, 8, and 9, it will be noted that they call for a "report for your locality." Where questions, 1, 2, 3, 4, and 5 ask for factual information known to the reporter, questions 6, 7, 8, and 9 call for an estimate on his part, the accuracy of which will depend upon a number of factors including in each case the exercise of observation and judgment.

Most reporters can probably make a pretty good guess in answering question number 6. On the other hand, it is doubtful in the committee's opinion whether the average farmer would be able to answer with any reasonable degree of accuracy questions 7, 8, and 9. It seems inevitable that the information obtained in response to questions 6 through 9—for whatever purpose it is to be used—is going to be less accurate than that of the first five answers and in many cases, in response to questions 7, 8, and 9, virtually worthless. If, on the other hand, questions 6, 7, 8, and 9 had been asked of the reporters with regard to their own operation, it seems to the committee that most of them would be able to answer the questions with a reasonable degree of accuracy.

August schedule complicated

Turning now to the August 1 cotton schedule it will be noted, in the first place, that all seven questions deal not with the individual farm, but with "your immediate locality" and therefore ask the reporter not for factual information that is within his knowledge, but for an estimate based on his observation and judgment. There is no explanation on the schedule of the difference, if any, between "your immediate locality" which is to be the scene of estimating activities in August, and "your locality" which was the arena of estimation for four questions in July.

Out of the seven questions asked in August, two of them—questions 2 and 6 (having to do respectively with the number of bolls per plant and the date on which the first bolls opened)—are of a reasonably factual nature. The other five questions are strictly in the nature of estimates and call for answers that are based entirely on the judgment of the reporter.

It will be noted that three of the questions (1, 3, and 7) call for answers in terms of percentages. As though dealing in percentages itself might not be enough to confuse the farmer-reporter, the Board has added an interesting complication by providing for question 1 a percentage formula in which 100 percent is not the maximum. The justification for this diverting situation (in which 100 percent is the highest answer that can be possible for questions 3 and 7, but is not the highest possible answer for question 1) is "explained" according

to the thinking of the Board's experts by the text appearing under "Instructions to reporters" called condition of cotton (item 1).

The formula which is to be used in deciding what percentage figure to put down in response to question 1 is explained in the following language:

> A "normal" or "full" yield, represented by 100 percent condition, is that yield per acre which is expected when the season is favorable and insects and diseases have caused little or no damage. "Normal" (100 percent condition) is higher than that of most seasons but may be exceeded in an unusually favorable year. If the present condition is 10 percent above normal, the answer should be filled in as 110; if 5 percent below normal, it should be reported as 95, etc. In estimating the condition of cotton, consider not only the growth and appearance of plants, but also all other factors which influence the probable yield per acre.

In defense of this instruction, considerable reliance was placed on the antiquity of the definition of "normal." It was pointed out that this definition has been in use at least since 1899, when it appeared almost verbatim in a publication of the Department of Agriculture. Rather than justifying the present use of this definition in a crop questionnaire, the committee wonders whether the mere fact that this devious explanation of "normal" has been in use since 1899 may not be responsible in some degree for the recurrent high error in estimates and for the constant revision of historical production figures which the Department finds to be necessary, even after the lapse of many years, in order to render them more accurate.

Questions vital to production estimate

Lest it be thought that the committee is dwelling at too great length on question 1 and its purported, but to the committee confusing, explanation, it should be remembered that question 1 and the answer made thereto by farmer-reporters, is almost the sole basis of estimating the production per acre, upon which the Board bases its over-all estimate of cotton production in its August report—and for that matter in its September report also. The same question, with the same "explanation" is asked in September and it is not until October that reports from ginners give the Board any check against the opinions that have been expressed by its crop reporters.

In addition to the confusion that might easily arise over the use of two different percentage formulas on the same schedule, it seems to the committee that the last sentence of the instruction is calculated to add to rather than detract from the possibility of confusion in the reporter's mind. That sentence reads:

> In estimating the condition of cotton, consider not only the growth and appearance of plants, but also all other factors which influence the probable yield per acre.

Question 7 relating to boll weevils will have a direct bearing upon the yield per acre. Question 3 asking for the percentage of full or perfect stand, will also have a direct bearing on the yield per acre. The number of bolls per plant, about which question 2 is concerned, also has a bearing on the yield per acre. Although the farmer-reporter is asked to report on each of these factors separately, he is also asked to report on them in combination—and with weighing factors which are not at all clear to the committee—in making his answer to question 1.

In view of the fact that the farmer must not only consider his answers to questions 2, 3 and 7 in answering question 1, but also in answering questions 4 and 5 (and in addition must consider his answer to question 1 in answering 4 and 5) it would seem to the committee that there is

considerably more than a little possibility of misinterpretation and confusion on the part of the reporter in trying conscientiously to provide the information requested.

When the importance of this questionnaire to the entire cotton industry is considered (for it is the information—and the only information—on which the critical August estimate of production is based) it would seem to the committee that every effort should be made to have this schedule ask questions that are as factual, specific, and understandable as possible. In this connection, the question was raised of the advisability of having farmers report the condition of their crop in percentage figures. It seems to the committee that few farmers would normally respond to the question, "How is your cotton?" by answering, "About 85 percent." The normal response of a farmer to that question would be to use a descriptive term: "poor," "fair," "good," "excellent," "half a crop," or "complete failure," for example. Serious consideration might be given to the use of such familiar descriptive terms to indicate the crop condition, with the Bureau's own statistical experts assigning to these descriptive terms whatever numerical designation they felt to be appropriate.

In summary, many of the schedules and questionnaires distributed by the Board to its farm reporters not only call for an estimate or an exercise of judgment on the part of the reporter, as distinguished from the mere reporting of facts within his knowledge, but pose the questions and the explanation of those questions in such a way that they might easily confuse the reporter or be subject to more than one interpretation. It seems to the committee that the closer such questionnaires can come to asking farmers for simple, direct answers about matters connected with their own farms—answers in terms the farmer is familiar with and uses habitually—the closer the resulting basic information is likely to approach factual accuracy. The comments which have been made about the July and August cotton schedules could be made about the cotton schedules for the other months and about the schedules sent out for reports on most other crops.

Recommendations

The committee believes that the Bureau should review most carefully the questionnaires and schedules which are sent to its crop reporters with a view not only to the information desired by the Bureau, but to the ability of the farmer receiving the questionnaire to understand the questions asked and to provide accurate, reliable answers. The committee believes specifically that the following objectives should be sought:

(1) The area covered by the question should, insofar as possible, be limited to the reporter's own farm or farming operations.

(2) The answers sought should be of a factual nature as distinguished from those which require an estimate or judgment on the part of the reporter.

(3) Questions should be simple, direct, and subject to only one possible interpretation.

(4) Explanations of questions, where necessary, should be in terms which will leave no doubt in the reporter's mind as to the meaning of the question.

(5) Consideration should be given to the phrasing of questions so that answers will be in descriptive terms with which the reporter is most familiar rather, if possible, than in terms of percentages.

Employees as Crop Reporters

The possibility of using employees of the Department of Agriculture as crop reporters was discussed during the hearings. To some members of the committee it seemed as though county agents, county PMA chairmen or secretaries, soil conservation technicians, or other employees of the Department who are regularly assigned to an area and are usually very familiar with the farming operations in that area, might make valuable reporters for the crop-estimating service.

Officials of the Board said that there had been some sporadic but unsatisfactory efforts to utilize the services of other departmental employees in this respect but that it was not the policy at the present time to do so. They gave three chief reasons for this. (1) The provision of law which requires that the monthly crop report "shall be gathered as far as practicable from practical farmers." (2) The fact that the making of crop reports is not a part of the regular duties of any employees of the Department of Agriculture and that experience has shown they cannot be relied upon to send the reports in regularly. (3) That because other employees of the Department have specific programs and responsibilities in which they are interested, there might be a natural tendency on their part toward bias in making crop reports. If a PMA official or county agent were making the report, for example, it was apparently feared that he might have a natural tendency to make his estimates of acreage and production conform to the goals for the county, which it is part of his job to encourage.

To the committee none of these objections to using paid employees as crop reporters seems to be particularly valid. (1) If the experience with several other laws which instruct the Secretary of Agriculture to do a particular thing in a certain way "as far as practicable" is any criterion, and the committee thinks it is, this limitation in the law would not prevent the Secretary from utilizing the services of bankers, millers or ginners, drug-store operators, or anyone else who might reasonably be presumed to have information to contribute.

(2) The making of crop reports is not now a regular part of the official duty of any employee of the Department of Agriculture, outside the Bureau of Agricultural Economics. It is entirely understandable that a busy county agent, PMA secretary, or other paid official would neglect from time to time to send in a crop report if they were merely asked to do so on a voluntary basis, as is the case with the farmer-reporters. If, however, the filing of crop reports were made a regular and routine part of the duties of any of these officials, it is hard for the committee to believe that they would neglect this part of their duties any more than they now neglect any other of their regular responsibilities. The filling out of a crop-reporting schedule is the work of but a few minutes for a person who is familiar with the information requested, and could certainly be done by any regular employee of the Department, no matter how busy he might be.

(3) It is easy to understand that a PMA secretary, an important part of whose duties are in connection with the achievement of specific goals for various crops in the county, might have a very natural tendency to express his optimism in the success of the goal program by filling out an acreage estimate for the crops which would tend to

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reflect the established goals, and might to that extent be misleading. There would be, however, very little reason for sending acreage reports to such officials because such information from them would require estimates on their part. The best source of acreage information is the farmer himself, who can report with factual certainty the acreage of the crop he has planted.

In the case of crop-condition reports, however, some judgment is required on the part of the reporter, whether the report deals only with his own farm, or with his general vicinity, as most of them do. It would seem to the committee that one of the best possible sources of information about general crop conditions in an area would be the county agent, county PMA chairman or secretary, secretary of the local production credit association or farm credit association, or even in some cases the manager of the local REA cooperative. These people are in constant daily touch with farmers from various parts of their county and in most instances their estimation of crop conditions and prospects would be the best that could be obtained. The committee can see no reason why their expert knowledge should not be utilized in estimating the crop outlook.

The possibility of using part-time paid employees for purposes of gathering crop information and making crop reports was discussed during the hearings. The Bureau has had some experience in this connection and has found it to be unsatisfactory. The committee is inclined to agree with the Board that part-time employees would probably not prove satisfactory for this purpose. Where a person is employed in such a manner for only a comparatively short period each month and receives only a minor part of his income from such employment, his major interest naturally lies in the direction of the work that is his major source of income. If he has no prospect of promotion or a career in the field of his part-time employment, the natural human tendency under such circumstances is to neglect the part-time work whenever there is a conflict between it and his major employment or between it and a prospective fishing trip or picnic.

Recommendations

In view of the fact that full-time employees of the Department of Agriculture and full-time employees of cooperative programs, such as the Extension Service, are in most cases intimately familiar with the condition and prospects of agricultural crops in their counties, and are without doubt among the most capable persons who could be found to report such information to the Board, it is recommended that the possibility of utilizing such employees as regular reporters of crop conditions and outlook be thoroughly explored in an effort to find a manner in which their expert information may be utilized in a way that is satisfactory, both to such employees and to the Board.

Estimates of Abandonment

One of the factors which, in the opinion of the committee, contributed to the error in estimating the 1951 cotton crop was the fact that the Board uses in computing its acreage for the August 1 report the 10-year average abandonment figures for the various States concerned, without regard to actual known conditions. The committee can see little logic to this procedure, particularly when the

Board is faced with known conditions which affect the normal rate of abandonment.

In several areas, cotton planting was late in the spring of 1951 and in a number of such areas wet weather prevailed even after planting so that many fields were in an extremely weedy condition about the first of July, leading to a higher than usual percentage of abandonment. One of the reasons now ascribed by the Board to its overestimation of cotton acreage in cultivation on July 1, was this unsatisfactory condition of cotton in many areas and the fact that on July 1 there were many fields which farmers had not quite made up their minds whether or not to abandon. Presumably, farmers included much of this questionable acreage in their reports of acreage in cultivation on July 1, even though it was never thereafter worked and may actually have been considered abandoned on July 1 for all practical purposes. Under present procedures employed by the Board there is no opportunity for a situation such as this to be discovered until the September 1 report, when farmers are asked to indicate the abandonment since July 1.

When the abandonment report is received on September 1, it may not be too reliable. At that time, 2 months after the July 1 report has been made, it is easy to see how a farmer's memory might well not be entirely accurate as to whether a field he now regarded as abandoned had actually been placed by him in that category before July 1 or afterwards. In other words, it seems to the committee that the mere lapse of 60 days between July 1 and the time the farmer is first asked to report on abandonment since July 1 tends to diminish the value and accuracy of the September 1 abandonment figures.

Particularly in view of the fact that cotton, unlike all other crops, is not the subject of a spring report on acres planted and that the report of acres in cultivation on July 1 is the first estimate of acreage, it seems to the committee that a report on actual abandonment up to August 1—the date of the first production estimate—might provide a valuable check on acreage for that first and very critical production report.

The Board knows, just as everyone familiar with cotton does, the factors which make for unusually high or low early summer abandonment. Where these factors are known to be present, it seems absurd to adhere slavishly to historical abandonment figures and not modify them either by the general knowledge of the statisticians or by a report from farmers.

Recommendation

The committee recommends that the Bureau consider carefully the advisability of using an actual estimate of abandonment in connection with its August 1 production report, instead of the routine 10-year average abandonment which it uses at present.

Reports From Ginners

As has been pointed out, the cotton production estimates of August 1 and September 1 are made entirely on the basis of reports received from farm crop reporters. Not until October is the second and more accurate source of information—the reports of cotton ginners—used in making production estimates.

Cotton ginners are required by law to report their ginnings monthly to the Census Bureau. These reports indicate not only the quantity of cotton ginned up to the date of the report, but also the estimated number of bales expected to be ginned by each gin during the remainder of the season. The experience of the Crop Reporting Board indicates that these ginners' reports provide a valuable source of information. There appears to the committee to be no reason why reports from those gins which are in operation before September 1 should not be used in making the September cotton production estimate. It is true that normally only a small proportion of the cotton crop is ginned prior to September 1 (the 10-year average is 7.16 percent).

In 1951, however, the records indicate that a little over 13 percent of the cotton crop was actually ginned by September 1. The reports from these ginners certainly would have added something to the accuracy of the information available to the Board and might have prevented the unjustifiably high estimate of cotton production that was made in September.

In addition, it seems to the committee that the Board might, at very little expense, select representative gins in various parts of the country and obtain reports from them on a scientific sampling basis which it could use as a further check point in its estimating procedure.

Recommendation

Although less than 10 percent of the cotton crop normally is ginned by September 1, the committee can see no reason why reports from gins which are then in operation should not be used in making the September 1 estimate of cotton production, and it so recommends. It recommends also, that the Bureau consider carefully the idea of making a scientific sampling of gins throughout the country, reports from which can be subject to special analysis and used as a further check point in making cotton production estimates.

Objective Measurements

The committee is of the opinion that the usefulness and accuracy of crop estimates would be improved if it were possible for the Board to use more objective data against which the opinions and subjective data obtained from its crop reporters could be balanced. By "objective data" the committee means the type of information which is obtained from cotton-boll counts, field measurements of corn and other grain, the use of crop meters, moisture tests, and similar observations where definitely factual data is obtained.

Prior to the war a number of these objective measurements were in use and were found to be quite helpful. They were largely discontinued during the early years of World War II, when travel by Bureau of Agricultural Economics field personnel was curtailed, and have not since been reinstituted in any general manner.

In the case of cotton, there is an objective measurement available later in the crop year—cotton ginning reports—not available in the case of most other crops. Even so, the early ginning reports are only partially factual information (number of bales ginned to date). They contain also subjective data (number of bales still to be ginned) and thus are not, until the ginning operation is completed, entirely objective.

The use of some objective measurements which can be applied to the early estimates of the cotton crop would probably add substantially to the accuracy of those estimates and, therefore, to their usefulness to the cotton farmer, the consumer of cotton, and the general public. The same is probably true for the other major crops. Although the Bureau reports that it has not seen any measurable effect on the precision of its acreage and production estimates as the result of the discontinuance of objective measurements, officials of the Bureau believe that the accuracy would be improved—particularly in unusual years—if such measurements were available.

An example of objective data is that obtained by the use of the crop meter. This is a device, consisting essentially of several accurately calibrated speedometers, which is attached to an automobile and operated as the vehicle is driven through an agricultural area. Using a separate instrument for each crop to be measured, the operator sets that instrument in motion whenever a field of that crop abutting on the road is being passed. At the end of the journey the ratio of each separate crop to the total distance traveled has been accruately measured. While the first time around on such a trip would give only very general information about the various crop acreages observed continued use of the instrument over the same route, year after year, will provide a very accurate indication of increases or decreases in the acreages of the various crops. Had this system of objective measurement been in use in 1951, with sufficient use in previous years to give an accurate basis of comparison, it is hard to believe that the 1951 acreage estimate could have been as far off as it was.

In addition to the general improvement in accuracy which the committee believes would result from the use of such objective data, their use would probably also increase the usefulness of the Bureau's estimates and reports in another manner—by providing some basis for a measurable determination of the percentage of error in the estimates. One of the complaints made by economists, statisticians, and others who use the Department's reports in a mathematical or scientific manner is that—unlike many other estimates and forecasts made on a sampling basis—there is no clear measurement of the probable error in the Bureau's statistics. Even the 5-year census of agriculture figures do not seem to provide a satisfactory bench mark for measuring the probable error in the Department's estimates. Although many of its reports are revised when census data become available, there are factors not measured by the census that also affect the estimates and continual revision of statistical data, even decades after the first reports have been made, has become a commonplace part of the Bureau's procedure. Objective data which would serve not only to increase the actual accuracy of forecasts, therefore, but which would also serve as a check point and aid in determining the probable error in the Bureau's estimates would materially improve the usefulness of the reports.

The various types of objective measurements mentioned here are only a few of the possible ones which might be used. Perhaps many which might be valuable have not even as yet been thought of. The use of any such sources of information will doubtless require some additional funds and the various methods which may be used to obtain objective data should therefore be carefully analyzed so that those may be used which will give the greatest benefit for the money expended.

Recommendations

It is recommended (1) that the Bureau reinstitute the use of objective measurements of known value, such as the crop meter, and request funds for their inclusion in its next budget; and (2) that it examine carefully other proposed methods of obtaining objective data and include those which appear to be worth while in its procedure.

Public Relations

Clearly, the job of selecting, contacting, and obtaining information from volunteer reporters is one of public relations in its truest sense. It is a specialized branch of public relations, admittedly, but nevertheless one in which the viewpoint, capabilities, and even prejudices of the reporters cooperating with the Board, are important factors to be considered. It seems to the committee that in framing the questions which are to be asked reporters it is almost as important to have a thorough appreciation of how those questions will look to the reporters as it is to know what information the Bureau's experts wish to obtain.

Work with volunteer groups and individuals is a specialized branch of public relations, which has been brought to a high degree of precision by experts in that field. Its methods and procedures are as definite, precise, and well understood by experts in that branch of public relations as are techniques of statistics to experts in that field.

In the committee hearings, it was brought out that the Bureau of Agricultural Economics has no one who is presumed to be an expert in the field of public relations working for or with it in the planning and execution of its contacts and relationships with its crop reporters. The committee means no disrespect to the personnel of the Bureau when it expresses the opinion that an expert in the field of statistics, even though his work may have involved long contact with volunteer reporters, is not necessarily an expert in the specialized field of public relations which involves working with, and obtaining the best results from, volunteers. It believes that many of the shortcomings and difficulties which have been discussed in connection with the selection of crop reporters and the obtaining of accurate information from them might be avoided if a competent public-relations expert were employed to assist in this portion of the operation.

Recommendation

The committee recommends, therefore, that a public-relations expert with a high degree of experience and qualification in working with volunteer groups and individuals be employed by the Bureau of Agricultural Economics to assist with the job of recruiting, maintaining, and making the best use of the Bureau's volunteer crop reporters, including the formulation of questions to be asked of the reporters.

Research, Analysis, and Experimentation

At the present time, the Bureau of Agricultural Economics has no branch or unit, or even a single individual, whose sole responsibility is to review and analyze current methods and procedures and to suggest possible improvements therein. It is assumed, and the committee knows that it is actually the case in many individual instances, that the personnel engaged in collecting data and making reports and

estimates, are constantly looking for ways to improve their techniques and their reports, and that many valuable suggestions for improvement are made by these individuals. There are several reasons, however, why the improvements which may be expected from this source are limited.

In the first place, those who have the responsibility of preparing and issuing the various reports of the Bureau have only a limited amount of time to devote to research, analysis, or theoretical consideration of their operations. The Bureau issues more than 500 regular reports each year—about two reports each working day. Many of the most experienced personnel are engaged in the preparation of a large number of these reports. In addition, the Bureau prepares and issues many special studies and reports, both for general publication and for the other bureaus, agencies, and departments of the Government. In other words, the most competent personnel of the Bureau simply do not have time to devote to extensive research and analysis of present procedures.

In the second place, the committee believes that it would be quite difficult for most persons working closely with procedures with which they are very familiar and in which they have a high degree of confidence, to detach themselves sufficiently from their day-to-day operations to consider them from a completely abstract and unsympathetic point of view.

Third, and most important, major improvements in the procedures and techniques of compiling and issuing crop reports and forecasts will involve not only theoretical analysis and research, but also a very considerable amount of actual testing and trial in the field. Some of the major problems to be solved will involve entirely new methods and procedures in the obtaining of basic information. The real value of any such proposals can be determined only after they have been actually tried on a carefully controlled scientific basis.

The work of evolving and trying out new methods and procedures must go on simultaneously with the work of collecting information and making reports under the present methods. Not until a new method has been thoroughly tried—perhaps over a period of years—with the results from it compared side by side with the results from present methods can it be determined, in some cases, that the existing procedure should be discarded and the new technique adopted. It is obvious that work of this type may be carried on effectively only by personnel who are devoting their entire time and attention to it, who have no responsibility for the work of issuing current reports, and who have such staff and facilities as to make possible actual field testing operations.

Recommendation

It is recommended that the Bureau of Agricultural Economics establish a unit devoted entirely to research, analysis, and experimentation directed at discovering the shortcomings in the Bureau's present methods and developing improvements therein. Such a unit should be free from any responsibility in connection with the issuance of current reports, should be composed chiefly if not exclusively of those not connected with the issuance of current reports, and should have sufficient budget and field personnel to permit whatever field operations are necessary to its proper functioning.

The Bureau has taken cognizance of this suggestion, which was made by the committee in the course of its hearings, and has included in its letter to Chairman Abernethy (appendix, p. 49) an estimate of the cost of such a research unit.

The committee cannot place too much emphasis on this recommendation. Many of the other recommendations made by the committee in this report are in the nature of suggestions which should be thoroughly considered by such a research unit before being adopted. In the opinion of the committee, the appropriation of the necessary funds for an adequate research unit as outlined herein will do more in the long run to improve the Bureau's reports than any other similar investment which could be made.

Regression Charts

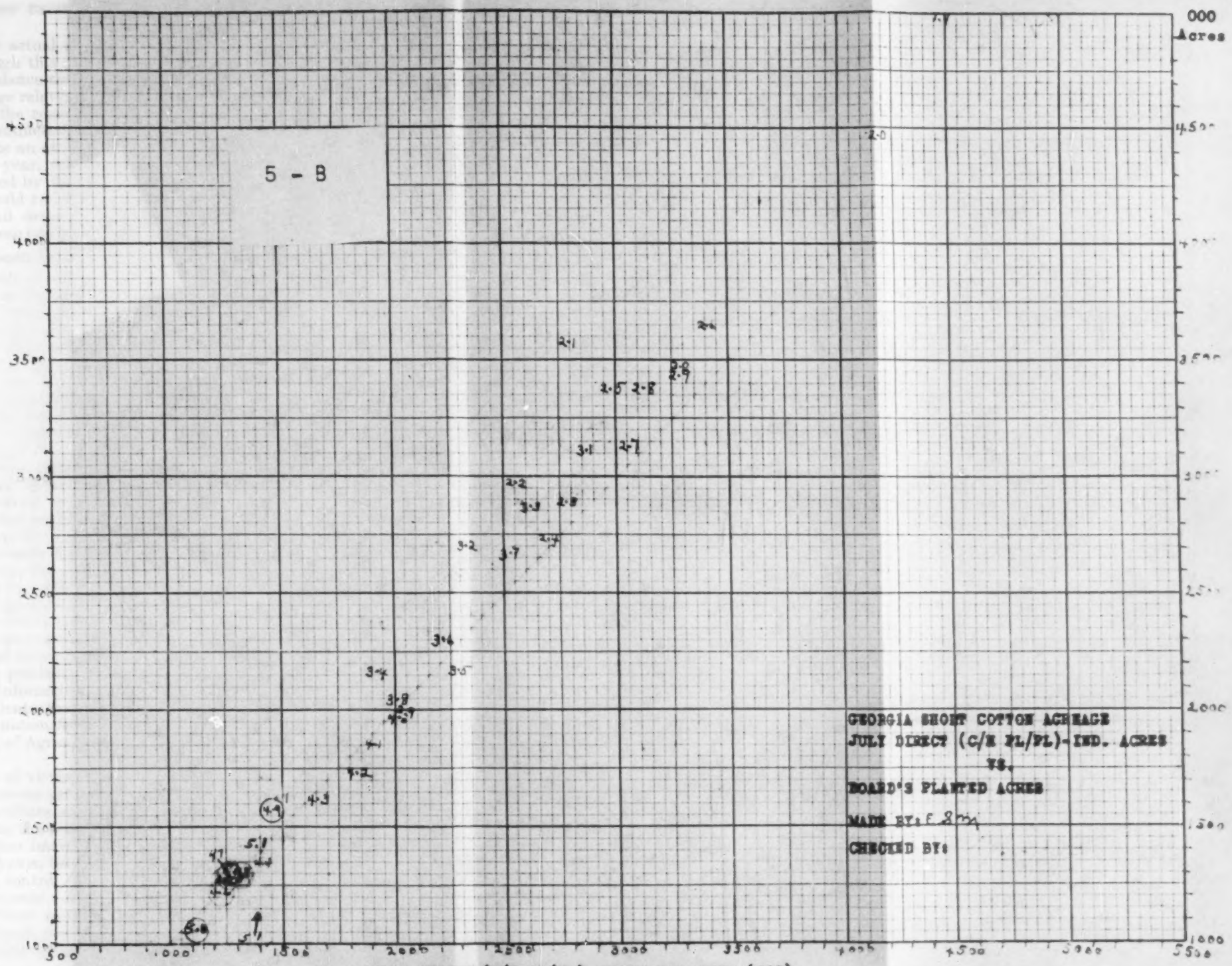
Thus far this report has dealt chiefly with the basic information obtained by the Crop Reporting Board for use in making its estimates, and the manner in which that information is obtained. The committee does not pretend to be competent to make a critical analysis of the statistical methods used by the Board to arrive at its crop estimates after the basic data has been obtained. In general, as these methods were discussed with the Board, they appeared to the committee to be logical and sound.

There is one aspect of the statistical operation, however, which the committee considers to be worthy of special attention. This is the device known as a "regression chart" which plays a very important part in the operation of transforming basic data obtained from farmers and others into actual acreage and crop estimates. One of these regression charts, typical in general of all such charts, is reproduced herewith.

Reduced to its simplest terms, a regression chart is a graphic representation of the relationship of the data reported by crop correspondents to some other data, usually the final, most accurate estimates of the same subject made by the Crop Reporting Board. Referring to the regression chart printed here as an example, this compares the acreage reported by crop correspondents in Georgia of acreage in cultivation on July 1 with the final determination made by the Board of the acres in cultivation at that time. The acreage reported by correspondents is positioned horizontally on the chart, and the acreage finally determined by the Board is positioned vertically on the chart. At the point on the chart where the horizontal and vertical lines thus established cross, a dot is placed with figures indicating the year represented by that dot.

Charts such as this are made from almost every conceivable bit of data reported by crop correspondents and others (such as ginners) from whom the Board obtains information. There are a minimum of 58 such charts for each State, dealing with cotton alone. This particular chart compares the data obtained from questions 2 and 3 on the July cotton schedule (p. 20). The symbol "(C/H PL/PL)" appearing on the table indicates that the chart is a comparison of "current-historical" planted acres.

After a chart such as this has been compiled to show relationships over a number of years, as this particular chart does, it will be found that the dots representing the relationship between the reports re-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ceived and the actual estimates assume a definite pattern. If a line is drawn through this pattern of dots along an angle which seems to most nearly balance the group, it is assumed that that line will represent the average relationship between the reports and the final figure.

The use of the regression charts makes the process of estimating acreage and production from farm reports a relatively simple operation. To make an estimate of what the actual acreage is in Georgia for any given year, for example, the statistician would position the acreage reported by the crop correspondents along the bottom of the table. He would run a line upward from that point until it touched the line he had drawn indicating the average relationship and the point where those two lines crossed would indicate the acreage estimate.

Do charts eliminate bias?

The net result of all this manipulating of figures, rulers, and dots is—according to the opinion of the Board's experts—to eliminate the bias and error from the basic data with which the Board works. They actually come up with estimates—so they believe—which are more accurate than the basic data upon which those estimates are made. The reason they give for this rather surprising result is that their regression charts, by graphically depicting the variance between original and final estimates year after year, automatically make allowance for the same kind of error or bias in the reports which come in this year, or next year, and thus permit that error or bias to be removed.

It seems to the committee that this system of eliminating error and bias in original reports might be used with more confidence if the Board were certain of two things: (1) That its final estimates—the "Board's planted acres" charted vertically on the table, were known to be accurate; (2) if the error or bias in the reports received from farmers and ginners is know to be constant.

Unfortunately, the committee is not convinced that either of these conditions exists. On the contrary, it seems quite clear that the Board cannot possibly be certain of either of these factors. Cotton is under acreage allotments and marketing quotas from time to time, and during those years when quotas are in effect there is a reasonably accurate actual measurement of cotton acreage. Even so, the statistics on cotton production are customarily revised from time to time as some later information becomes available. Census figures or other data may indicate that changes should be made in cotton acreage, yield, or production figures and these changes are made frequently by the Bureau of Agricultural Economics, even in figures that are many years old.

In the case of virtually all crops for which reports are issued, it is customary to revise acreage and production estimates after each 5-year census of agriculture, and these revisions frequently go back for many years, changing the estimates of acreage, yield, and production which up to that time have been considered accurate. It is quite clear, therefore, that even the one element of the chart over which the Board has complete control (its own final estimate) cannot be considered absolutely accurate. It should be pointed out that in the case of crops where there is no acreage allotment and marketing quota, the actual acreage is never measured for the Nation as a whole and there is no really factual check of the accuracy of the published esti-

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mates of acreage and production. No one ever knows how much they may be in error.

Turning to the second condition which must be considered in the accuracy of the regression chart technique—the constancy of the error or bias in original reports—it is plain to the committee that the Board actually knows very little about this subject. The Board assumes that the error or bias in farmer's reports is about the same from year to year. It has to assume this or the regression charts would be worthless. Actually, as far as the committee has been able to find out, there is no substantial evidence for this assumption.

No adequate measure of error or bias

The Board knows very little about why there is a bias of any kind in farmers' reports, what the extent and reason for the error in the reports may be, what conditions are likely to induce error or bias, and what the effect of nonresponse to its questionnaires may be. This is not necessarily a criticism of the Board. The answers to these questions probably can be determined, but they can be determined only by scientific and probably rather costly analysis of the reports submitted by farmers and also of the "nonresponders"—those who for some reason or other do not fill in the reports and return them to the Board. There has been neither the money nor the personnel for the Board to make this kind of study. This type of investigation is, in the opinion of the committee, one of the first major problems to which the research and experimentation unit, which the committee hopes can soon be set up in the Bureau, should turn its attention.

Taking 1951 as a specific example, it is clear that there was considerable error or bias, or both, in the reports from farmers of their July 1 acreage. For some reason the acreage reported by farmers, and adjusted by the Board on its regression charts, added up to considerably more acres than were actually in cultivation at that time. What caused this error or bias. With its present staff and techniques the Board can only guess. Probably the abnormal spring weather which resulted in a considerable acreage of cotton being on the verge of abandonment on July 1, contributed. Farmers were uncertain when they made their July 1 report whether or not they were actually going to continue to cultivate all of their cotton. Possibly the high goals established by the Department of Agriculture for the 1950 cotton crop, and urged upon farmers by local PMA committees, had something to do with it. Farmers who were not planting as much acreage as the county committee asked for might have been a little ashamed, and might simply have failed to send in their reports. In that case the reports actually received were only from farmers who were expanding their acreage, and would give a distorted estimate. Perhaps the knowledge that cotton may again soon be under quotas influenced the farmers and induced those reporting to "puff up" their acreage just a little in case it might be used in some future year as a basis for their acreage allotment. Perhaps there were other factors which caused the error in 1951. The Board simply does not know.

Probably the most unfortunate thing about the regression chart method of trying to eliminate bias and error is that in most years it seems to have worked reasonably well. Compared to modern statistical-sampling methods of estimating, it is a horse-and-buggy procedure, but since it has not broken down altogether, it has been

patched up and made to do. Had it not worked with a reasonable degree of satisfaction, it would probably have been discarded long ago for a more modern, probably more costly, and perhaps more accurate method.

The weakness of the regression charts is, of course, that they will operate satisfactorily only under "normal" circumstances. While they make allowance and automatic adjustment for error and bias that has been present in reports over a period of years, they provide no means for accurate measurement of that error or bias, for identifying it, or even for indicating whether it is present or not in any given set of reports. They are utterly useless to indicate error or bias appearing for the first time. Thus they may give reasonably accurate results in a "normal" year but go completely "haywire" in an "abnormal" year, such as 1951 evidently was.

Recommendations

From the evidence presented to the committee (although it did not go extensively into the subject) it is apparent that a crop estimating and reporting system based on the "modern" methods if statistical sampling would be much more costly than the method now in use. It doubts that the improvement in over-all accuracy would justify the increased cost. On the other hand, the committee is not satisfied with the present method or the results it produces. It believes, however, that this method can be improved and that the major efforts of the Bureau should be directed to that end. Many of the recommendations which have been made in other sections of this report will contribute materially to improvement of the basic data on which the regression charts are based.

The committee recommends, therefore, that every effort be made to improve the value of the regression chart system now in use, particularly so that it will be reasonably accurate in unusual as well as in "normal" years, and so that its margin of error can be calculated. Study and identification of the reasons for bias and error in original reports, the reasons for and the effect of nonresponse to questionnaires, development of objective measurements and data, development of better questions and a better farm-reporter list, all should contribute to improvement. The over-all objective of the research and experimental unit should be the improvement of this system.

Weather Conditions

In analyzing the reasons for the unusually high degree of error or variation in the 1951 cotton crop estimates, it seems that about one-third of the over-estimate of the crop may be attributed to the error in estimating the acreage in cultivation on July 1, and that the other two-thirds is attributable to some other factor.

The Crop Reporting Board originally estimated that there were 29,510,000 acres of cotton in cultivation on July 1, 1951. In its final report on 1951 cotton production issued May 8, 1952, the Board corrected this July 1 estimate to 27,917,000, indicating an error of 5.4 percent in the July acreage estimate. On the basis of the 10-year average of production for the United States, this represented an error in bales amounting to 847,476. The final estimate of cotton production in 1951 is 15,130,000 bales, compared to the September 1

estimate of 17,291,000 bales, a difference of 2,161,000 bales, making the quantity attributable to the July 1 acreage error approximately 39 percent of the total difference between September and the final estimate of cotton production.

This leaves almost two-thirds of the reduction in the estimate of production to be accounted for by causes other than the error in acreage. Since insect infestation and damage was not excessive in 1951, it is apparent that most of the reduction must be attributed either to adverse weather or to the Board's handling of its basic data and its methods of making its estimates.

Looking back at the 1951 cotton season, it is clear that there was considerable unfavorable weather during the growing season. It is also clear that most of this unfavorable weather occurred prior to the issuance of the September cotton report and virtually all of it before the middle of September. In spite of this fact, the production estimate for September was the highest of the year (actually up 25,000 bales from the August estimate) although most of the adverse weather had occurred prior to the issuance of that report.

Estimates based on "normal" weather

In announcing its estimate of cotton production as of September 1, 1951, the Board made the following statement which appeared at the top of its statistical table:

> The final outturn of cotton compared with this forecast will depend upon whether the various influences affecting the crop during the remainder of the season are more or less favorable than usual.

A similar statement appears above each of the monthly estimates of cotton production. It means that the estimates of the Board are based upon the assumption of "normal" weather conditions for the remainder of the crop season. It clearly implies that if the weather is better than usual for the remainder of the season, the estimate may be increased; if it is worse than usual, the estimate will probably be lowered.

If this statement means anything at all, it is impossible to reconcile the tremendous reduction in the estimates of cotton production which occurred subsequent to the September report. On the basis of the Board's own statement in making its September 1 report, the estimates of production should have been increased, rather than decreased in the monthly reports made subsequent to that date.

If the committee were not convinced (as it wants to emphasize unmistakably that it is) of the individual and official integrity of the members of the Bureau of Agricultural Economics and the Crop Reporting Board, it would look for factors other than mere error or shortcoming in the Board's statistical methods as an explanation of this paradoxical situation. Believing, as it does, in the collective and individual integrity of the Crop Reporting Board, the committee is convinced that the reason for this almost fantastic error in estimates lies in the methods and procedures used by the Board in making those estimates. It is quite clear to the committee that although the damage to the cotton crop from adverse weather occurred almost entirely prior to September 1, the full effects of that damage were not reflected in the Board's estimates until the November report was released.

The committee will admit that this startling fact has caused it much concern. It must also admit that although the situation was dis-

cussed at great length during the hearings it is still far from clear to the committee why this should have happened or what can be done to prevent its occurrence in the future.

In the opinion of the committee there is a definite hiatus—a serious shortcoming—somewhere in the procedures and methods of the Crop Reporting Board which makes it possible for weather conditions which have existed for several months not to show up in the estimates of the Board until 6 weeks (the period from mid-September until November 1) after those weather conditions have ceased.

Bad weather in July and August

The situation that bothers the committee is rather clearly depicted in the Weekly Weather and Crop Bulletin of the Weather Bureau which is issued weekly throughout the year. The bulletin summarizes weather and crop conditions from all parts of the country and also makes specific reports on several important crops, among them cotton.

Prior to the middle of September, there was continual warning in the bulletin of unfavorable weather affecting cotton.

The bulletin for the week ending July 3, for example, reported most cotton in the main belt showing "some improvement" and "generally in good condition" but reflected the wet, unsettled spring by reporting also that "many stands are irregular and the crop is generally late." It also reported that in Texas (where 43½ percent of the reduction in this year's estimate was made) there was "some deterioration from dryness in the extreme southern portion." For the remainder of July, the bulletin warned each week that, while the main belt was showing fairly good development, many fields were still weedy and rain was needed in many parts of the belt.

The first weekly bulletin in August continued the same general report, showing fair progress of the crop but an increasingly urgent need for rain in many localities. In its report for the week ending August 14, the bulletin said:

> Mostly fair, hot, sunny weather promoted the development of cotton and favored the checking of weevil activity in the middle and eastern cotton belts. Much of this region, however, would welcome a good rain, although the need is not urgent except locally. Showers improved conditions in extreme northern sections and in parts of Alabama, Georgia, and most of the Carolinas. The opening of bolls has extended northward to the northern portion of the Gulf States, southern Arkansas, and northern South Carolina. Condition of the crop over the eastern two-thirds of the main belt is mostly good, although much is about 2 weeks late in north-central interior areas. The serious drought and 100° to 110° temperatures over most of Texas favored weevil control but checked the fruiting and development of cotton and caused much premature opening of bolls on nonirrgated land.

On August 21 the bulletin again warned of "some deterioration and premature opening of cotton bolls in dry sections" and that "there is still need for a good general rain, particularly in Texas, Oklahoma, southern Arkansas, the southern Appalachian region, Tennessee, and some adjacent areas." It mentioned again, "further deterioration" in nonirrigated cotton in Texas.

Warning of "deterioration"

In the bulletin for the week ending August 28, there is again mention of the premature opening of bolls in drier sections, the need of a rain in the central area, and "further deterioration" of cotton in central and southern Texas.

In the bulletin for the week ending September 4, the progress of cotton is described as follows:

> Continued hot, mostly dry weather over the main cotton area checked weevil activity and promoted the maturity and harvest of cotton, but resulted in additional reports of premature opening of bolls and many complaints of deterioration. * * * In Texas cotton made poor progress * * *.

The bulletin for the week ending September 11 reported similar conditions: hot, dry weather favoring cotton harvest in those areas where the crop was matured but—

> causing some additional deterioration, particularly in dry western and middle portions of the belt.

Although it is not possible to classify the Weather Bureau's weekly reports with statistical accuracy, it is clear that up to this point there has been a continual warning of possible damage to the crop in many areas of the country—and particularly in the central and western areas—from the hot, dry weather. It seems to the committee that the weather reports during July, August, and the first 2 weeks of September indicate growing conditions that are in the aggregate considerably below normal and contain a clear warning in the frequent mention of the lateness of the crop, premature opening of the bolls, shedding, and "deterioration", of substantial damage to crop prospects.

Weather improves in September

From the middle of September onward, however, the weather reports are exactly the opposite. They indicate weather that appears to be in the aggregate, more favorable than normal to the development and harvesting of the cotton crop. The bulletin for the week ending September 18, for example, has this to say:

> Rather general showers, accompanied by cooler weather, spread southeastward over western and central portions of the main belt on Wednesday and Thursday and the eastern portion from Thursday to about Monday. Late cotton in the northern interior areas was benefited and premature opening of bolls was mostly stopped. * * *

The bulletin for the week ending September 25 reported that opening and harvest of cotton generally made good progress in the main Cotton Belt, mentioned showers in Oklahoma and Texas and remarked that "late cotton generally shows improvement." Continued favorable conditions were reported in the bulletin for the week ending October 2. In the bulletin for the week ending October 9 there was this report:

> The opening of bolls and harvest of cotton generally made good to rapid progress during the week in the main Cotton Belt under the influence of fair, warm, sunny weather.

Except for the retarding effect of unseasonably low temperatures in scattered areas of the belt, the report for October 16 showed continued favorable conditions. By this time the bulk of the cotton crop had been made and attention was focused on harvesting. The bulletins for the last 2 weeks in October described harvesting making "good to rapid progress" in almost all parts of the Cotton Belt.

In its efforts to solve the mystery of why it should have taken a minimum of 6 weeks (from the middle of September until the November cotton report) for the effects of adverse weather to be reflected in the Board's estimate of cotton production, the committee discussed

the matter at length with officials of the Board and approached it from many different directions. Let it restate at this point the basic situation.

Between September 1 and November 1 there was a reduction in the Board's estimate of cotton production for 1951 of 1,520,000 bales. This reduction must be attributed entirely to factors affecting the estimated production per acre, because the acreage used by the Board in making its estimates remains unchanged through the months of September, October, and November. The unfavorable weather conditions affecting the 1951 crop occurred almost entirely prior to September 1 and had ended completely by the middle of September. In spite of this fact, the September estimate of cotton production, instead of being lower than the August estimate, was actually 25,000 bales higher, notwithstanding a reduction in estimated acreage of 366,000 acres between August and September. Although weather conditions from the middle of September onward were generally more favorable than normal for cotton development and harvesting, the estimate of production was reduced 360,000 bales on October 1 and another 1,160,000 bales on November 1. Since the decrease in these 2 months must be attributed entirely to crop conditions, and since crop conditions in October and November were above average, it is obvious either that there was a time lag of 6 weeks or more in reflecting crop conditions which actually existed during July, August, and early September, or that there was something seriously wrong with the information on which the September and October estimates were based.

No adjustment for weather

In discussing this situation with officials of the Crop Reporting Board, a number of very interesting facts were brought out which may have some bearing on the problem. In the first place, there is no effort made by the Board to adjust the data which is received from State statisticians and farmer reporters for known weather conditions. There were two reasons, the Board officials said, why they could not make such an adjustment after the data had been received in Washington. First, because weather is unpredictable, and second, because that would entail substituting their own judgment, or a "subjective" determination, for the objective methods by which their present estimates are arrived at.

The committee agrees with the Board's position that the science of meteorology has not yet reached the point where a long-range prediction of weather conditions can or should be used in making crop forecasts. They would almost certainly add to rather than decrease the uncertainty of crop estimates, if used as a determining factor.

On the other hand, it seems quite clear to the committee that the probable future effect on a particular crop of known past weather conditions, can be determined with a reasonable degree of statistical accuracy and that such a factor should certainly be taken into consideration, somewhere along the line, in making a crop estimate.

The 1951 cotton crop estimate is an excellent illustration of such a situation. Quite obviously, the damage which weather did to the 1951 cotton crop occurred, in general, prior to September 1. Apparently, however, this damage was not sufficiently visible to farmers on September 1 to make them take it into full consideration in making their crop reports to the Board on that date.

Reports give only present condition

When the farmer crop reporters received the schedule late in August asking for their September 1 report, they found thereon only questions (see p. 13) asking for the "condition of cotton on September 1." As the farmer looked out across his cotton fields, he may have decided in the exercise of his judgment that the condition of the cotton was practically perfect—say 90 percent. At the same time, that farmer may have known that there had not been a drop of rain in his area for the past 5 weeks and that, while the cotton on the day he made out his September 1 report looked to be in excellent condition, if he and his neighbors did not get a good rain in the next week or 10 days, the condition of their cotton would deteriorate until it would be only 50 percent of normal by the end of that 10 days. Nowhere on the report schedule, however, does the Board ask him for this kind of information. In other words, if the weather conditions which at the moment he fills out the report constitute a serious threat to his crop, have not actually made themselves evident in the appearance of the crop, they will not be taken into consideration in the report he sends to the Crop Reporting Board.

The Board seems to think that the farmer will take this sort of situation into consideration in reporting the condition of his crop and that the questions regarding probable yield per acre will also give some indication of the farmer's judgment of the future probable effects of past weather conditions. The committee cannot agree with this. Every question on the report calls for information based on the present condition of the crop. There is nothing to indicate to the farmer even that he should take into consideration anything but the present condition of the crop in estimating the probable yield per acre requested in questions 4 and 5.

It seems quite clear to the committee, in spite of the Board's assumption at times to the contrary, that there is nothing whatever in the report form sent to farmers which calls for an estimate on their part of the probable effect on the future condition of their crop of past or current weather conditions. If the answer to the question regarding eventual yield per acre is to be based on anything except known present condition of the crop, then it must call for a guess on the part of the farmer as to what weather conditions are going to be for the rest of the season. There is no alternative. The answer to that question must either be based on known, present conditions or it must be based on a guess as to what the whole growing season is going to be. If, as the committee believes the report form clearly indicates, the estimate of yield is to be based on the present crop condition, it can give no indication of the weather factor discussed here. If, on the other hand, the farmer's estimate of yield is to be based on his guess as to how the whole growing season will turn out, the committee would consider his answer to be practically worthless for statistical purposes, since the farmer certainly can have no better idea than the Weather Bureau what weather conditions will be 2 weeks or 2 months from a given date.

As an alternative source of information of this type from the farmer, it was pointed out that the report schedule suggests that the farmer use the back of the form for comments. It was stated that many farmers do make comments on the back of the form and that

these comments are "quite helpful" to the State statistician in arriving at a summary for his State. It was pointed out that farmer reporters frequently make comments on the back precisely in the nature of the factor being discussed by the committee, for example, "Have had 3 weeks of dry weather. Crop looks good now, but two more weeks of hot, dry weather will injure it seriously."

If the State statistician takes comments such as this into consideration in making his report and his estimates for the State (upon which the national reports and estimates are based) then the crop estimating procedure is certainly straying far from the objective methods which the Board says it seeks to follow at all times. Any estimate which might be made by the State statistician on the basis of comments such as this from farm reporters is far outside the field of statistics. It may be that the State statistician's subjective adjustment of the State figures, on the basis of his own judgment and of the comments which have been gratuitously provided by some of his farm reporters, may improve the report for his State. The committee is inclined to believe, in fact, that it would improve the State report if that adjustment is made on the basis of sound judgment. On the other hand, it is certainly not an objective measurement of any kind and its employment by the same Board which will not make an adjustment of national production figures on the basis of its own subjective knowledge of weather conditions, and which objects to the use of descriptive terms rather than percentages by farmers in reporting crop conditions, seems strange to the committee.

Weather factor could be developed

It also seems strange to the committee that a factor for estimating the probable future effect on a crop of past weather conditions cannot be developed and applied by the Board to crop estimates so as to increase the accuracy of those estimates. Although weather is one of the things we can do very little about, there are few matters affecting our daily existence upon which more complete statistics have been kept or for a longer period of time. It seems probable that in order to develop a reliable factor for integrating past and present weather conditions with future crop prospects, some strictly objective data such as soil-moisture measurements, boll counts, etc., would have to be used. That such a formula or factor is possible, however, seems quite clear from statistics published by the Bureau of Agricultural Economics itself. In spite of the protestations of members of the Board that it is virtually impossible to determine by formula the effect of weather on the crop, it is interesting to note that the Bureau has done precisely this, not only with regard to the weather but with regard to other factors affecting crop development.

In a volume entitled "Statistics on Cotton and Related Data" published by the Bureau of Agricultural Economics in June 1951, appear tables showing for the United States and for each of the major cotton States the percentage reduction from full yield per acre of cotton from various causes. The factors listed as causes include deficient moisture, excessive moisture, other climatic conditions, plant diseases, and insect damage. The data in these tables goes back to 1909 and assigns a definite percentage of reduction in full yield to the various causes each year thereafter. Following is the table referred to for the United States. There are similar tables in the volume for

Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, Missouri, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia.

TABLE V.—*Percentage reduction from full yield per acre of cotton, by stated causes, United States, 1909 to date* [1]

[Percent]

Year beginning August [1]	Deficient moisture	Excessive moisture	Other climatic [2]	Plant diseases	Boll weevil	Other insects
1909	14.9	6.0	7.7	4.2	6.1	1.8
1910	12.2	5.1	5.3	4.3	5.3	2.2
1911	9.8	2.6	3.0	.4	1.3	6.6
1912	8.1	7.6	5.0	4.3	3.3	3.2
1913	15.2	2.0	5.9	.5	6.7	2.2
1914	7.9	2.9	3.0	.2	5.9	3.9
1915	6.8	5.7	6.9	1.9	9.9	2.3
1916	9.2	9.1	7.0	.9	13.4	2.4
1917	15.1	1.7	8.8	1.3	9.3	2.9
1918	23.8	.9	4.6	2.0	5.8	2.1
1919	2.7	15.3	3.2	1.3	13.2	5.6
1920	2.2	8.8	2.2	1.1	19.9	4.0
1921	8.6	4.3	3.1	.9	31.0	4.5
1922	10.3	4.9	2.3	.8	24.2	2.4
1923	7.2	8.0	2.8	.7	19.5	7.1
1924	14.0	5.0	2.3	.8	8.0	4.0
1925	24.6	1.4	3.0	.7	4.1	2.2
1926	5.3	3.2	2.9	2.1	7.1	8.9
1927	6.4	4.9	2.8	1.5	18.5	4.4
1928	4.4	7.3	4.9	1.9	14.1	3.4
1929	10.8	7.2	6.0	2.3	13.3	2.5
1930	27.7	2.8	6.3	1.7	5.0	1.9
1931	8.3	2.6	3.5	2.0	8.3	1.8
1932	8.0	3.9	6.1	3.2	15.2	3.1
1933	6.8	2.6	3.7	2.3	9.1	2.2
1934	20.7	1.9	7.3	1.9	7.3	1.6
1935	9.2	3.7	6.5	2.2	8.1	5.0
1936	16.2	1.9	8.4	2.2	4.9	3.0
1937	5.7	1.5	4.1	2.2	5.3	3.0
1938	6.8	3.3	4.0	1.9	9.9	4.2
1939	10.1	4.2	5.9	1.8	8.7	2.2
1940	5.5	6.5	6.5	2.0	6.5	1.9
1941	3.3	8.6	3.8	1.5	15.4	4.8
1942	3.6	3.5	4.0	1.5	8.0	4.0
1943	12.5	1.7	5.9	1.4	6.1	2.0
1944	7.5	1.7	3.9	1.5	3.9	2.3
1945	4.0	6.7	6.2	1.6	10.2	2.6
1946	7.4	7.9	5.2	1.4	13.0	2.1
1947	12.0	2.2	5.2	1.1	7.6	1.6
1948	8.8	1.2	5.0	.8	5.0	1.6
1949 [3]	2.1	7.2	3.2	1.1	17.5	1.7

[1] Average of 13 States, Missouri, Virginia, North Carolina, South Carolina, Georgia, Florida, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, Texas.
[2] Floods; frost, cold or freeze; heat and hot winds; storms, including hail.
[3] Preliminary.

In the 20 years since 1930, according to this table, weather factors have had a very measureable effect on cotton production. On the average, during those 20 years, dry weather has caused an annual reduction of 9.31 percent in the crop, wet weather a reduction of 3.78 percent, and other climatic conditions a reduction of 5.24 percent. In combination, these three weather factors have been responsible, on the average, for more than 58 percent of the annual reduction in yield per acre of cotton. It should be noted also, that deficient moisture—which was the primary weather difficulty encountered in 1951—is, on the average, the most important factor reducing the per acre yield of cotton.

In the important cotton States of Oklahoma and Texas, where 31.8 percent of the cotton produced in the United States has been grown

in the past 5 years, and where 53.5 percent of the reduction in the 1951 estimates occurred, dry weather plays an even more important role than in the Nation as a whole. In Oklahoma, deficient moisture was responsible for an average reduction in yield per acre of 18.35 percent in the 20 years 1930–49, while the combined weather conditions have been responsible for 73 percent of the average reduction in yield per acre. In Texas, during the same period, deficient moisture has resulted in an average annual reduction of 12.2 percent in yield per acre, and all weather conditions combined have been responsible for more than 61 percent of the average annual reduction in cotton yield.

In order to provide a clear picture of the effect and importance of accurate and prompt evaluation of the weather conditions and their effect on the estimates of cotton production, the committee requested the Crop Reporting Board to prepare a condensed table showing its estimates of acreage, condition of the crop, yield per acre, and estimated production for 1951 for the United States and individually for each of the States for which individual estimates are made in the monthly estimates of cotton production. The table also shows the 1940–49 average yield per acre for each of the various areas.

TABLE VI.—*1951 official cotton reports, by months, August through December*

UNITED STATES

[1940–49 average yield per acre 266.0 lbs.]

Month	Acres for harvest (thousands)	Condition (percent)	Yield per acre (pounds)	Estimated production (bales)
August	[1] 28,910	76	286.7	17,266
September	28,544	74	290.8	17,291
October	28,544	74	284.7	16,931
November	28,544	----	265.2	15,771
December	26,698	----	274.5	15,290
Final (May 1952)	26,687	----	271.7	15,130

MISSOURI

[1940–49 average yield per acre 424 pounds]

August	[1] 549	63	280	320
September	493	69	312	320
October	493	67	321	330
November	493	----	321	330
December	490	----	312	320
Final (May 1952)	490	----	302	309

VIRGINIA

[1940–49 average yield per acre 389 pounds]

August	[1] 22	90	415	19
September	22	----	415	19
October	22	----	415	19
November	22	----	393	18
December	21	----	365	16
Final (May 1952)	19	----	357	14

[1] Acreage in cultivation July 1, less 10-year average, natural abandonment.

TABLE VI.—*1951 official cotton reports, by months, August through December*—Con.

NORTH CAROLINA

[1940–49 average yield per acre 369 pounds]

Month	Acres for harvest (thousands)	Condition (percent)	Yield per acre (pounds)	Estimated production (bales)
August	[1] 764	86	383	610
September	763	82	384	610
October	763	88	399	635
November	763		377	600
December	690		382	550
Final (May 1952)	690		376	542

SOUTH CAROLINA

[1940–49 average yield per acre 308 pounds]

August	[1] 1,162	81	355	860
September	1,163	82	363	880
October	1,163	86	363	880
November	1,163		359	870
December	1,045		394	860
Final (May 1952)	1,070		389	871

GEORGIA

[1940–49 average yield per acre 239 pounds]

August	[1] 1,458	75	303	920
September	1,452	79	309	935
October	1,452	83	309	935
November	1,452		311	940
December	1,400		321	935
Final (May 1952)	1,410		317	931

FLORIDA

[1940–49 average yield per acre 173 pounds]

August	[1] 67	80	215	30
September	68	83	212	30
October	68	86	212	30
November	68		226	32
December	65		258	35
Final (May 1952)	62		250	32

TENNESSEE

[1940–49 average yield per acre 376 pounds]

August	[1] 827	75	342	590
September	813	78	360	625
October	813	75	363	615
November	813		325	550
December	775		333	540
Final (May 1952)	765		334	534

ALABAMA

[1940–49 average yield per acre 275 pounds]

August	[1] 1,566	73	300	980
September	1,566	76	314	1,025
October	1,566	77	299	975
November	1,566		288	940
December	1,460		303	920
Final (May 1952)	1,460		299	909

[1] Acreage in cultivation July 1, less 10-year average, natural abandonment.

TABLE VI.—*1951 official cotton reports, by months, August through December*—Con.

MISSISSIPPI

[1940–49 average yield per acre 326 pounds]

Month	Acres for harvest (thousands)	Condition (percent)	Yield per acre (pounds)	Estimated production (bales)
August	[1] 2,575	81	373	2,000
September	2,533	75	379	2,000
October	2,533	75	341	1,800
November	2,533		313	1,650
December	2,330		333	1,620
Final (May 1952)	2,340		329	1,608

ARKANSAS

[1940–49 average yield per acre 343 pounds]

August	[1] 2,301	76	313	1,500
September	2,251	77	350	1,640
October	2,251	73	341	1,600
November	2,251		288	1,350
December	2,070		290	1,255
Final (May 1952)	2,025		295	1,249

LOUISIANA

[1940–49 average yield per acre 281 pounds]

August	[1] 981	85	428	875
September	986	77	414	850
October	986	82	389	800
November	986		375	770
December	920		400	765
Final (May 1952)	935		391	760

OKLAHOMA

[1940–49 average yield per acre 173 pounds]

August	[1] 1,588	82	206	680
September	1,600	61	188	625
October	1,600	62	174	580
November	1,600		150	500
December	1,450		149	450
Final (May 1952)	1,475		150	462

TEXAS

[1940–49 average yield per acre 181 pounds]

August	12,810	67	187	5,000
September	12,600	63	183	4,800
October	12,600	63	183	4,800
November	12,600		164	4,300
December	11,800		167	4,100
Final (May 1952)	11,750		166	4,061

NEW MEXICO

[1940–49 average yield per acre 490 pounds]

August	331	92	435	300
September	330	86	436	300
October	330	80	436	300
November	330		422	290
December	320		425	284
Final (May 1952)	315		414	272

[1] Acreage in cultivation July 1, less 10-year average, natural abandonment.

TABLE VI.—*1951 official cotton reports, by months, August through December*—Con.

ARIZONA

[1940–49 average yield per acre 449 pounds]

Month	Acres for harvest (thousands)	Condition (percent)	Yield per acre (pounds)	Estimated production (bales)
August	[1] 557	91	707	820
September	557	88	707	820
October	557	84	707	820
November	557		707	820
December	555		741	860
Final (May 1952)	545		705	803

CALIFORNIA

[1940–49 average yield per acre 600 pounds]

August	[1] 1,334	90	630	1,750
September	1,329	92	650	1,800
October	1,329	91	650	1,800
November	1,329		650	1,800
December	1,290		657	1,770
Final (May 1952)	1,320		640	1,765

OTHER STATES

[1940–49 average yield per acre 405 pounds]

August	[1] 18	70	328	12
September	18		333	12
October	18		333	12
November	18		299	11
December	17		286	10
Final (May 1952)	16		246	8

[1] Acreage in cultivation July 1, less 10-year average natural abandonment.

As has been stated previously, it will be noted that there is no change in the acreage estimate from September through November. Any change in the forecast of production which occurs during those three important months comes about as the result only of the condition of the crop and changes in the estimated yield. It is clear, therefore, how extremely important it is that the information regarding crop conditions on which the Board bases its estimates on these 3 months should be as accurate as possible and also why it is of extreme importance that weather conditions should be reflected in the national estimates as quickly as possible.

Study of the table discloses a number of interesting situations. In making its production estimate for September, for example, the acreage for harvest was reduced 366,000 acres from the August estimate. The condition of the crop on September was reported as 74 percent of normal, compared to 76 percent in August. In spite of this reduction of 2 percent in the crop condition, the yield per acre was estimated 4.1 pounds higher in September than in August, resulting in a production estimate for the Nation as a whole of 25,000 bales above the August figure.

In looking at the statistics for the various States, it is difficult to reconcile the estimated yield per acre for the various months with the reported condition of the crop for those months. From studying merely this statistical summary of the reports, it would almost seem that the Board first estimated the production for the State in terms

of bales and then assigned to the State a yield per acre which would achieve that production, regardless of the reported condition of the crop on that date.

An interesting observation in this connection is that the reduction between October and November in the estimate of cotton production for the United States as a whole, was 1,160,000 bales. By reference to the State tables, it will be noted that the reduction between those 2 months was 80,000 bales in Oklahoma and 500,000 bales in Texas. This is a total of 580,000 bales, which is precisely 50 percent of the reduction for the United States as a whole. This is very possibly a mere coincidence, but it is the sort of situation which one would expect to find in statistics of this type if the Board had first decided on an over-all reduction in its production estimate for November and then parceled that reduction out among the States, giving half of it to Texas and Oklahoma and dividing the remainder among the other States.

Recommendation

That the Crop Reporting Board study its whole operation—from the selection of sources of information and formulation of questions, to the final step of making national production estimates—in order to:

1. Reflect more quickly and accurately changes in weather and crop conditions; and
2. Develop some means of applying to crop estimates the probable future effects of past weather conditions.

General Suggestions

During the course of the hearings a number of miscellaneous suggestions for possible improvement of the Board's reports and estimates were made. Following are some which the committee believes merit further consideration.

(1) *Earlier estimates of cotton acreage and probable production.*—As has been pointed out, the laws relating to crop reports specifically prohibit any estimate of cotton acreage prior to July 1 or any estimate of production prior to August 1. For most other crops, the Board issues reports of intentions to plant, spring reports of planted acreage, and estimates of probable production based on figures of past production per acre.

(2) *More frequent condition reports.*—Several persons have suggested that the issuance of condition reports at 2-week intervals during the critical part of the growing season might provide a more reliable and responsive guide to changing conditions.

(3) *More frequent acreage estimates.*—Under present laws and procedures, cotton acreage is estimated only once during the entire growing season (July 1) and actual abandonment is estimated only once (September 1). More frequent estimates of acreage in cultivation and of abandonment might well prevent errors due to acreage miscalculations such as occurred in 1951.

(4) *Special handling of Texas reports.*—Texas is such a large State that it is subject to many different kinds of weather, in different parts of the State, during the cotton-growing season. Because of this fact, statisticians have found considerable difficulty in evaluating and handling the reports of cotton conditions in Texas on a State-wide basis. The State produces so much cotton that it is extremely im-

portant that the estimates for that State be as accurate as possible. Better accuracy might be attained by dividing Texas, for crop reporting purposes, into two or more climatically related districts.

(5) *Application of other Department funds to crop reporting.*—In the operation of the Department of Agriculture there are many programs and functions which must depend entirely upon the Crop Reporting Board for the basic information with which to operate. Some of these activities and functions have a much larger budget for doing something with the Board's statistics than the Board has for compiling and preparing the reports. A specific case in point, and there are others, is the function of preparing and publicizing crop goals. This function is entirely dependent upon reports of the Board for its basic information. Without such information goals could not be established and unless the information is accurate the goals will not mean much. In spite of the relative significance of the crop estimates and the goals program, two or three times as much money is customarily budgeted for the preparation and dissemination of crop goals as is budgeted for the whole operation of the Crop Reporting Board. It seems to the committee that transfer to the Board of some of the funds from programs such as this, which depend entirely upon the Board's estimates for their information, might be worth while from the standpoint of providing more reliable and more workable information to those activities.

(6) *Collaboration with the Bureau of the Census.*—Every 5 years a census of agriculture is customarily taken by the Bureau of the Census. The present procedure is for a large number of temporary and special employees to be engaged for this work each 5 years. At these 5-year intervals they accumulate a mass of data which then must be tabulated and analyzed, a process which is so complicated and voluminous that it is frequently 2 or 3 years after the census has actually been taken before information from it is available. This is in many respects an unsatisfactory situation. It seems to the committee that it might be possible to take the census of agriculture on a continuing basis and to coordinate the census interviews and enumeration in some respects with the Crop Reporting Board's activities. A schedule of census numerating might be worked out which would give the Crop Reporting Board valuable check data for crop estimates and at the same time, provide a continuous flow of agricultural census information to the Census Bureau which would be processed as it arrived and made available to the Nation in a reasonably short time thereafter.

APPENDIX

FEBRUARY 21, 1952.

Hon. THOMAS G. ABERNETHY,
House of Representatives.

DEAR MR. ABERNETHY: This is in reply to your letter of February 8, in which as chairman of a subcommittee of the House Committee on Agriculture you raised two specific questions concerning the Bureau's work in collecting, analyzing, and publishing crop and livestock estimates. The questions were:

"(1) Are you satisfied with the results of your present system of crop estimating and reporting?

"(2) Do you know of any steps which might be taken to improve the accuracy of these forecasts and reports?"

In answer to the first question, we believe that, taking into account the number and timing of reports issued in relation to the resources available, the Crop Reporting Service is a remarkably dependable and economical operation. Nevertheless the answer to your question is that we are not wholly satisfied with the results of the present system. Our crop and livestock estimates are necessarily based upon sampling data and are also often forecasts, based upon assumption as to average weather or probable behavior of farmers over some specified future period. We are interested in any methods or techniques which may be used to reduce differences between the earlier forecasts or estimates and final results. This interest stems not only from our desire to use better methods as technicians but is also directly tied to the increasing dependence which is being placed upon these statistical materials by farmers, by the trade, and by the Government.

To answer the second question specifically, there are a number of steps which we believe are worth study and consideration on the part of the subcommittee and others who may be interested in improving the accuracy of crop and livestock forecasts and reports. The various items which we shall call to your attention are based in part upon our own experience, in part upon discussion with the subcommittee and in part upon suggestions or recommendations from users of crop and livestock reports or from outside statisticians who are interested in the field.

In discussing this second question in more detail, there are some over-all considerations which should be kept in mind. The Crop and Livestock Reporting Service was originally started for the purpose of providing general information to farmers and others interested in agriculture, chiefly on an annual basis. However, the Service has now become the source of official information on many phases of agriculture which is extensively used throughout the whole economy, with increased emphasis upon the use of closely timed monthly and other short-term reports as well as the need for breaking some of the annual estimates down on a county basis. It is also necessary to realize that the problem is one of reducing or minimizing errors or differences—that is, the fact remains that those using or interested in crop and livestock estimates must also realize that any service which is timely and economical must necessarily be based upon sample data. This means that the reports will always be subject to some degree of sampling or statistical error. Furthermore, early or midseason forecasts of probable production will always be subject to more or less variation between the date of the forecast and the final outturn depending upon changes in weather and other factors affecting yield.

We must also call the attention of the subcommittee to the fact that most of the steps or methods which seem to offer the greatest possibility of substantial improvement are beyond our present facilities. However, in your letter you indicate that "the committee requests that you include all recommendations which you believe might improve this service without regard, for the moment, to the cost of such improvements." But we are not suggesting that the problem is simply one of funds or personnel. The problem first of all centers around the question of what should or should not be done. With respect to those items which it appears, after study and consideration, should be tried, the question then

turns upon whether or not we have resources already available that can be used or whether the adoption of the new methods or techniques must depend upon the availability of additional resources. In the following discussion, we shall indicate those steps which we think are within our own resources and, in those cases where additional facilities would be necessary, we indicate the approximate amount of funds which on the basis of current costs and salary rates would be involved.

The various steps or changes which we believe it would be worth while for the subcommittee to consider include:

(1) *Expanding reporter lists.*—The voluntary crop reporter should continue to be the primary source of information. The development and maintenance of reporter lists is one of the continuing problems facing the Crop Reporting Service. But simply adding names to the lists is not the answer. In fact, indiscriminate addition of reporters may do injury rather than good.

Building up the reporting lists must be done with care to see that the addition is properly distributed as between various areas, classes or types of farms, etc. Work on lists is at present a regular and continuing job in all field offices. One suggestion is that county agents and PMA committeemen be used as reporters. We believe there would be some serious draw-backs to the adoption of such a procedure. But the State statisticians do often use county agents and the PMA field offices as sources of names of farmers who may serve as reporters. If the subcommittee believes that more systematic use of these sources should be employed, the BAE will endeavor to secure the cooperation of the extension directors and State PMA offices in a systematic canvass of county agents and PMA committeemen to obtain names of farmers who they believe would make good reporters. Such a step might provide a very useful list of new contacts, which could be used for recruiting new reporters in areas where current lists need to be expanded.

(2) *Additional field travel and observation.*—Field travel to observe crops and secure opinions of well-informed producers and others (such as county agents, dealers and handlers, credit agencies, PMA committeemen) has long been recognized as an important means of obtaining information. We are now reviewing our work program and probable budget for the coming fiscal year in an effort to provide for some additional field travel this year, but the extent to which this can be accomplished will be limited. In fact, it can only be done through reducing the over-all program of reports and services, thereby eliminating some part of the present workload. There are not many reports or services which can or should be so cut or eliminated.

Meanwhile, there are also some dangers inherent in placing too much reliance on travel and field observations that must be recognized and held in check. In the early days, excessive dependence was often placed upon the observations of the field statistician. Many of the improvements that have been made over the last three decades have been the result of greater emphasis upon more objective techniques and the development of measures that have narrowed the range in which individual judgments of statisticians or "informed persons" influence the estimates or determinations. More extensive field travel and observation must be so planned as to reinforce sound sampling methods and more objective measurement.

The crop meter, cotton-boll counts, field measurements of corn and wheat, were instituted during the 1920's and 1930's as attempts to obtain objective measures from systematic field travel and observation. These were used extensively for several years but were dropped early in the World War II period due to travel restrictions. It is only fair to observe that the discontinuance of these measures had no measurable effect on the precision of the acreage estimates and forecasts of production. However, our State statisticians believe it would be helpful, especially so in unusual years, if a systematic plan of travel, crop meter, and field measurements can be carried on a continuing basis. Such work would need to be carried for several years in order to build records and develop methods which would be most effective. There are many times when information secured this way has helped in making interpretations of sample data and resulted in better estimates.

(3) *Reporter response.*—This problem is closely related to the two previous topics—reporter lists and field travel. As indicated previously, the addition of names to a list is not sufficient but must be based upon selection of reporters after full analysis of the universe to be sampled.

The problem is how to increase the number of returns relative to the number of inquiries made or questionnaires mailed out. Voluntary response is never assured. But limited experience with paid reporters has not been particularly effective and, entirely aside from questions of cost, we believe voluntary farmer

respondents are far better sources of information. Experience to date indicates that the best results are obtained where some personal contact is maintained with the reporter. This is possible only through extensive travel by the State statistician or his assistants. Use of "newsletters," special envelopes, and similar devices are reasonably effective and economical, but meeting with reporters is most beneficial in several ways: First, his interest is increased and, equally important, he has opportunity to ask questions on various reporting problems.

Development of the reporter lists on a sound sampling basis, providing for travel to be combined with reestablishment of crop-meter measurements, where practical, development of objective field measurements such as boll counts, corn and wheat measurements, and field men to contact and counsel with reporters, could best be developed as an integrated project. Such a project would require added clerical and technical personnel in all field offices and sufficient funds for travel and other costs.

(4) *Developing and testing new methods.*—Discussion with the subcommittee has raised several questions relative to the possibilities of new techniques. Among these is the possible use of enumeration by personal contacts in the field. The use of enumeration has some limitations as well as some advantages.

As we see it now, the use of personal enumeration is costly and apparently too slow for our regular, closely timed, month-to-month reports. But for some types of surveys it is a very desirable method, and the use of a considerable volume of personal interviews as supplementary to the regular mail inquiries would seem to offer some real possibilities. It has been possible, for example, to use personal interviews to a limited extent in collection of price data in 12 field offices for the past year with excellent results. Some experimental work in California in estimating grapes by actual objective on-the-ground measurements is most promising. We have made several enumerative surveys to obtain information on subjects that could not be obtained in any other way and have found, in addition, that the farmers visited were good sources of additional information via mail. We believe personal interviews could be used to good advantage as a check on individuals who do not answer mail inquiries and also to get large-scale operators properly represented in the sample. With respect to these and other uses, the interview or enumerative methods should be explored on a scale extensive enough to be proven as an operating technique before any steps are taken to incorporate such change in the present system.

There are a number of other fields where a considerable amount of research and testing can be recommended. In the past, considerable work has been done in the field of crop-weather relationships. Investigations in this field should be continued and expanded. In connection with developing better mailing lists and sampling procedure, a series of specialized studies are needed of the adequacy of present mailing lists to discover when changes are needed and finding sources for constructing new lists according to most efficient designs.

To undertake a comprehensive research and testing program along the lines above indicated would necessitate development of a unit of qualified technicians and a reasonable fund to employ enumerators. Since much of the basic office or laboratory research has already been done, a number of "pilot" operations should be undertaken in selected States or areas on a sufficient scale to indicate the feasibility of actually using such methods, both from the viewpoint of the technical estimating and actual administrative or operating problems involved.

(5) *Speed-up of service and interim reports.*—There is a continuing demand that the Crop and Livestock Reporting Service provide more timely reports, including the issuance of more frequent reports, particularly during critical periods. The requests thus far have been limited to the major crops and the annual livestock inventory report, although practically every year demands are made for a special or midmonth report to meet a critical situation on some crop.

At the present, the elapsed time between the mailing of reports to the State office by farmers and the issuance of the monthly report from Washington is usually 8 days for cotton and 10 days for the general crop report. Under present arrangements, there is a limit to the time that can be cut off this schedule. Possibly a maximum of 2 days could be cut off the general report by the use of wire services and further decentralization of the estimating function, but that would require increasing the peak load at the first of the month and could be accomplished only by increasing the field force and adding to the communication cost.

Probably a more economical approach would be provision for midmonth reports on selected major crops and the speeding up of the annual livestock inventory reports. In years when conditions are changing rapidly, a week or two or even a few days can bring about significant changes that probably should be appraised

by an official report. The weekly weather and crop reports that are now issued in about 36 States meet this need in part, but it is not immediately possible to expand it to all States nor are these reports comprehensive enough to meet the needs for a midmonth quantitative estimate. The weekly reports should be continued, however, and extended as rapidly as possible to all States.

(6) *Price reports.*—Prices received by farmers for commodities sold and prices paid for commodities bought are the basis for the farm price indexes of the Bureau, including the official Parity Index and the computation of parity prices. These reports are extremely important to the producers since they are basic to the price support and production programs. During the past year funds were provided which permitted the expansion of the price program in 12 of the 41 field offices. The developing of special lists and questionnaires for particular commodities, more careful analysis of price data and relationships, the use of enumerative methods to supplement mail questionnaires, and the improved allocation of mail samples after analysis of reporting lists are among the positive contributions to improve accuracy of our price data in these States.

One of the most significant developments in the price field has been the speed up of the quarterly price data from 19 States for use in the Parity Index. Before December 1950, these quarterly data on prices paid by farmers could not be summarized for use in the Index until a month later. Now data from 19 States are used currently, with the effect of considerable improvement in the accuracy of the currently issued Parity Index.

(7) *Special reports.*—Reports on stocks, storage capacity, dairy production, and special purpose compilations are all being used increasingly and cannot be overlooked in considering the need for strengthening and improving crop and livestock estimates.

The preparation of the reports on stocks and storage capacity are now being handled with a minimum of personnel and time, yet the data are being used extensively. There is a pressing need for strengthening these reports.

The work in the field of dairy statistics has been developed on a cooperative basis in many States. This work has resulted in gradual improvement but it has had to be limited because of the inadequacy of personnel in some field offices to take on the added work that would be entailed under a cooperative program.

A few statistics on farm employment are published monthly for geographic regions and the country as a whole. Farm wage rate data by States are obtained only quarterly and among other uses are included in the computation of the Parity Index. These basic employment and wage data need strengthening. In addition, much more detailed and extensive farm employment and wage data may be needed especially in periods of acute labor shortage.

(8) *Legislation.*—The committee may wish to consider possible changes in legislation which would permit improvement in the service rendered. The most important of these items is the legislation restricting the first estimates of cotton acreage to that in cultivation July 1. This has been in effect for many years but was relatively unimportant until the allotment programs were started. It would be desirable to relate the first estimate of cotton acreage to total acreage planted—the same as for other field crops. Growers can report more accurately on the acres they plant than what is there at a particular date. In years like 1951, they are not certain as to whether some acreages will be left for harvest or will be lost in a few days. Estimates of total acreage planted would also be more useful in connection with the various programs. Since the present legislation limits reports on cotton prospects to five dates—August 1, September 1, October 1, November 1, and December 1—it would be necessary to make appropriate modifications if it were decided that midmonth reports were desirable.

(9) *A plan for development.*—If the subcommittee wishes to consider a plan for the strengthening and further development of the crop and livestock reporting work, we would emphasize that any plan must be developed as a continuing program and that revolutionary results cannot be expected immediately. Any plans or recommendations which are developed should look several years ahead.

Meanwhile, as indicated earlier, we are in the process of reviewing our present workload to adjust it to meet the increasing cost of operations in order to stay within our present facilities. This adjustment will mean some reduction in the services now offered, but we do hope we can make enough adjustments to allow some increases in travel funds in the more important cotton, corn, and wheat States during the coming season. We will also endeavor to make further use of the Extension Service and PMA sources to obtain names of possible reporters than is now the case. But these shifts cannot go very far toward covering the various suggestions so far outlined. To do this would require—

(*a*) The first step toward the development of an integrated program for strengthening the Crop Reporting Service should be directed toward strengthening of the 41 State offices to carry out the present program of reports. Each office is an integrated unit covering all phases of the program. It is, therefore, unrealistic to consider each phase such as building up reporting lists, or field observation, and use of crop meters, as independent operations because the addition of personnel for one such purpose would permit some work on others. Therefore, if it were determined that the strengthening of the State offices was desirable the most efficient thing would be to add enough personnel and funds to permit economic operation.

The addition of an average of two clerks and one statistician per State office, together with funds for travel and other costs, is about what would be required for the proper development and expansion of lists and follow-up work with reporters. This same personnel, however, would be available on a year-round basis and could, in addition, aid in developing the crop meter routes and other field observations and counts in the growing season and generally implement the handling of the present program. It would also provide for some midmonth reports on major crops during critical seasons, permit extension of the weekly weather and crop report, and aid in speeding up the annual livestock inventory reports.

This addition to the field staff and the necessary funds for travel and other costs, together with some staff additions in Washington, would necessitate an increase of $660,000 to $790,000 in available funds, depending upon the amounts allowed for strengthening stocks, utilization, and similar nonacreage or nonproduction estimates.

(*b*) A second segment of work which should be undertaken at the same time additional field staff is provided is developing and testing new methods for use in agricultural estimates.

Such a program adequately staffed is the most constructive method for future development of the service. A number of proposals have been made for adoption of new techniques. Whether these proposals would result in any considerable improvement, whether they are adaptable to the timing of the program, how expensive they are in relation to the greater accuracy that might be expected, are all problems that would have to be studied through actual operations paralleling the methods being used currently.

The size and scope of such a program could vary considerably but it should be large enough to permit experimentation on a scale extensive enough to be proven in actual operation. As a matter of fact, it is now the laboratory findings that need testing at a "pilot plant" stage.

A unit set up to do this work should be separate and free from the demands for current operations. Its personnel should be available to aid the entire staff in analysis of sampling problems that will arise in the building of reporting lists on sound sampling principles, study of weather-crop relationships, and to carry out experimental work in the field without interruption to the current program.

A unit capable of carrying out a reasonably satisfactory program would require an additional fund of $265,000 of which around $80,000 would be used in employing field enumerators and other temporary personnel.

(*c*) The next step in the program should be to round out the price-reporting work that has been started in 12 field offices, including acceleration of quarterly reports from all States for use in the current Parity Index. By itself, this would cost about $10,000 per State office. But if this were done following or concurrently with the first step in strengthening field offices it could probably be accomplished for about $6,500 per additional office, or $188,500 total, for adding statisticians and clerks and by providing for travel in the remaining States as was done in the first 12 offices.

(*d*) Whenever enumerative methods, objective tests, or other new procedures are found to be better than previous methods, provision should be made for their general adoption to the fullest extent practicable. If, for example, it develops that enumeration by itself or in combination with mailed inquiries proves of sufficient value in reducing the variation or error in the estimates at costs which would appear reasonable in proportion to the probable improvement in accuracy, provision should be made to adapt these procedures to the regular program. Final appraisal of these questions, including estimated costs, would have to wait upon experimental work in the field.

(*e*) *Additional services.*—In the foregoing we have centered the discussion chiefly around improving the accuracy and reliability of crop and livestock reports. We also are constantly being asked to supply additional information on

various subjects. There is a long list of such requests. The following partial list is representative: Expand the quarterly cattle-on-feed report to all States; provide monthly turkey poult production reports and turkey fryer estimates; provide current estimates on the calf crop; collect information on volume of natural cheese marketed as processed cheese and cheese spreads; collect information on geographical distribution of dairy breeds; provide information on volume of different grades of whole milk received at plants; estimate number of farms and land in farms; expand coverage of seed crops by variety, type, and kind; and estimate farm production, sales, and income from forest products, floriculture, etc. We could list many more. The point we wish to make is that these are requests for additional services which would not be covered by the estimates given above, although in a few cases the strengthening of the field staff would allow some additional service, chiefly as a byproduct of improving existing estimates. The chief item of this kind relates to the problem of quality or soft corn in the Midwest. We believe this could be handled under the research and field staff suggestions outlined under (*a*) and (*b*).

In conclusion, may I say that the chairman of the Crop Reporting Board, Mr. S. R. Newell, and I will be glad to supply any further detail or discussion relating to the above statement which may be desired or to assist as best we can in explaining any other approaches or suggestions in which the subcommittee may be interested.

Sincerely yours,

O. V. WELLS, *Chief.*

A CRITICAL EVALUATION ON AVAILABLE AGRICULTURAL STATISTICS [1]

(Ivan M. Lee, University of California, Berkeley)

The first systematic attempt to collect agricultural statistics dates back more than a century ago to the census of 1840.[2] From that date forward an increasing volume of agricultural statistics has been collected periodically in census enumerations decennially to 1920 and quinquennially thereafter. A rudimentary system of annual agricultural estimation was also begun about 1840 in the Patent Office. Upon Commissioner Ellsworth's resignation in 1845, however, interest in agricultural statistics subsided in the Patent Office, and it was not until after the Department of Agriculture was organized in 1862 that annual intercensus estimates were again revived.[3] Current monthly reports on crop conditions also predated the establishment of the Department of Agriculture by a few months. Orange Judd, editor of the American Agriculturalist, published summaries of crop condition reports submitted voluntarily by subscribers to his paper for the 5 months, May through September 1862.[3] Judd's efforts were the forerunner to the Department's program of monthly reports on crop prospects which have been issued regularly during the growing season since the first publication in July 1863.

Since 1863, the estimating work of the Department of Agriculture has expanded very greatly until today a truly impressive volume of agricultural estimates is published on a current basis. A few of the important markers along the path of expansion are the annual estimates of acreage, yield, production, and value of crops in 1866; annual prices in 1867; monthly prices in 1908; quarterly farm wage rates and the expanded livestock estimates in the 1920's; and farm employment in the 1930's. Along with this expansion has come a marked decentralization of the estimating function relegating more and more of the control over each stage of the estimating process from the revision of lists through processing of data to the State or regional offices. The dominant position held by the Department's official estimates currently make these estimates the logical focal point in any attempt at general appraisal.

The substantial expansion in the volume of agricultural estimates has not been paralleled by major improvements in estimating methods. This is somewhat distressing in view of the significant developments in the theory of sample design—particularly in the past 20 years. The method which currently predominates involves the use of mailed inquiries to voluntary respondents for the collection of basic data and an assortment of devices designed to remove bias in the trans-

[1] A paper presented at the annual meeting of the American Statistical Association, Boston, Mass. December 27, 1951.

[2] Benedict, M. R. Development of Agricultural Statistics in the Bureau of the Census. Journal of Farm Economics, vol. 21, November 1939, pp. 735-760.

[3] Ebling, Walter H. Why the Government Entered the Field of Crop Reporting and Forecasting. Journal of Farm Economics, vol. 21, November 1939, pp. 718-734.

formation of basic data into published estimates. Aside from the introduction of geographic stratification in the early 1900's and periodic efforts to increase the size of samples, no fundamental changes in the sampling techniques underlying the bulk of the current estimates are evident since the beginning of the estimating program. Current official descriptions of methods employed pay lip service to fundamental weaknesses in method. Yet, at least equal prominence is given in the literature to official views that the estimates published are of "serviceable accuracy" and, although the methods possess theoretical weaknesses, they are in the main sound for the practical job of supplying usable estimates. If supplemental information in the Department's files give empirical support to this conclusion, research workers and others who use the published agricultural statistics need to be more fully informed since from a study of the literature currently available it is difficult for one seriously interested in appraisal to avoid the conclusion that the validity of the large bulk of estimates published is really not known.

A complete evaluation of available agricultural statistics must embrace such characteristics as breadth of coverage, geographical detail of estimates, timeliness and frequency of releases, etc. It is recognized that an appraisal of methods cannot itself be divorced from these considerations. But considering the present state of the Department's estimating program it is the opinion of this writer that the criterion of reliability must have top priority over all other criteria of evaluation. The choice of optimum methods of estimation in an environment in which the estimating agency is faced with limited resources and a strong demand for breadth and timeliness of coverage may well dictate some sacrifice of precision in the estimates. But it is meaningless to suggest that the Department's present methods somehow approach the optimal if the magnitude of the precision sacrificed is not known.

The most significant appraisals of reliability of the present estimates will come from objective, empirical analyses and tests. Unfortunately, the paucity of necessary data precludes the possibility of an empirical approach to appraisal in this paper. Neither can a detailed, critical review of methods which pays due respect to each of the various supplemental devices employed be compressed into these few pages. However, the methods underlying the bulk of the estimates published, whether they be acreage, yield, prices, employment, wage rates, etc., are similar in essential features and, hence, several observations with regard to method are fairly generally valid across the board. Most of the points raised in the following pages are not new. Repetition of valid criticism is considered appropriate since the apparent confidence placed in the estimates within and without the Department leads one to question whether the methodological weaknesses have not been too lightly dismissed. It is recognized that the uncertainties regarding the validity of estimates implied by the rather general comments which follow must in fact apply with unequal force to various specific estimates published.

In what follows, frequent reference is made to objective methods of estimation. As used here, this term is interpreted broadly to mean optimum methods consistent with sound sampling theory. More specifically, it implies: (1) random selection of sampling units and the incorporation in the sample design of techniques for dealing with nonresponse; (2) carefully formulated concepts of what is being observed in the sample and its relation to what is being estimated; (3) the restriction of sample inquiries regarding such measures as prices received by farmers and wage rates to the respondent's objective observations based on his own operations and, thus, the abolition of inquiries which require the respondent to estimate magnitudes for which he lacks both the necessary data and the appropriate statistical techniques; (4) the processing of sample data through formally developed estimating procedures which when coupled with efficient sample designs yield estimates possessing desirable statistical properties; and (5) the inclusion along with each published estimate of the appropriate measure of sampling error, hus giving the user of the published estimates meaningful measures of precision.

CRITICAL REVIEW OF METHODS

Sources of possible distortions in the Department's estimates are traceable to the following three main causes: (1) the selectivity of sample response without adequate attention to the problem of nonresponse; (2) problems of definition and concept of what is being measured; and (3) the opportunity for the injection of personal judgment by the State statistician, members of the Crop Reporting Board, and other professional members of the Department at virtually every stage of the estimating process from the initial collection of data to the final revision of an estimate—perhaps several years later. The first and third of these

apply generally to virtually all estimates published on a regular basis while the second is applicable more specifically to prices, wage rates, crop yields, and in a different sense to farm-employment estimates.

SELECTIVITY IN SAMPLES

From the beginning of crop and livestock estimating, major reliance has been placed on mailed questionnaires to voluntary correspondents as the method of data collection. General and special mailing lists have been built up over the years with revision periodically to drop consistent nonrespondents from the lists and to add new, promising reporters from previous rural mail carriers' surveys or from some other source. The possible selective character of such lists is obvious. Furthermore, from the current mailing list for the general crop and price schedules as well as for the regularly conducted rural mail carriers' surveys, a 25- to 30-percent response is apparently typical.[4] Selectivity of response, therefore, may stem both from the accumulated selectivity of the lists in the State statistician's files and from the selectivity of response to any particular survey. The possible consequences of selectivity and nonresponse are, of course, well known and are recognized by those responsible for the estimates. Selectivity affords opportunity for an unknown bias in the final estimate while a high rate of nonresponse, aside from its implication regarding selectivity, renders effective control of sample size and, hence, sampling error net of bias impossible.

DEFINITION OF WHAT IS BEING MEASURED

Problems of defining what is being measured are apparent in all "judgment for the locality" type of questionnaires such as prices received by farmers, farm wage rates, and crop yields, and in a different way in some "individual farm" reports; as exhibited specifically in farm employment estimates. "Judgment for the locality" surveys represent an attempt to estimate a universe parameter through observations on a related sample characteristic. This procedure need not be objectionable if the relationship between what is being observed and what is being estimated is known with measurable error. In the Department's estimates adequate measures of these relationships cannot be presumed to exist. In the price schedule, reporters are asked to estimate average prices received by farmers in their localities reporting a single price for each product which is "representative of all transactions."[5] Similarly wage reporters are asked to report "average rates being paid to hired farm labor in your locality."[6] What is being estimated, therefore, is not what prices and wages actually are but what reporters estimate them to be. It is difficult to understand why price and wage reporters are not asked to report actual prices paid farmers and actual wages paid farm laborers. The prevailing supporting argument for the judgment inquiry seems to rest largely on the belief that superior estimates will thereby be obtained from samples which are too small to yield sufficiently precise estimates based on direct reports. If samples are too small for adequate precision, the solution would seem to lie in increasing the size of the sample or otherwise altering the sample design and not in the adoption of judgment inquiries, which can only serve to further complicate objective evaluation of error.

The basic data on which initial estimates of crop yield are based are the reporters' judgments of local crop conditions expressed in percent of normal. A normal condition is described officially in the following rather lengthy quotation.

"A normal condition is not an average condition, but a condition above average, giving promise of more than an average crop. Furthermore, a normal condition does not indicate a perfect crop, or a crop that is or promises to be the very largest in quantity and the very best in quality that the region reported upon may be considered capable of producing. The normal indicates something less than this, and thus comes between the average and the possible maximum, being greater than the former and less than the latter. The normal may be described as a condition of perfect healthfulness, unimpaired by drought, hail, insects, or other injurious agency, and with such growth and development as may be reasonably looked for under these favorable conditions."[7]

In this instance the reporter is asked not only to judge the average crop conditions in his locality but also to qualify this judgment relative to what is at best

[4] U. S. Department of Agriculture. The Agricultural Estimating and Reporting Services of the United States Department of Agriculture. Miscellaneous Publication No. 703, Washington, D. C., December 1949, p. 16.
[5] Ibid., p. 239.
[6] Ibid., p. 126.
[7] U. S. Department of Agriculture. The Crop and Livestock Reporting Services of the United States Miscellaneous Publication No. 171. Washington, D. C., 1933, p. 23.

a vaguely defined base. Later in the season condition reports are apparently supplemented by reports of probable yield for localities and State statisticians' judgments regarding yield prospects.

Of all the estimates made by the Department, crop yields seem most amenable to objective measurement and estimation. It is understandable that early season yield estimates based on objective measurement may be subject to relatively wide margins of error because of the additional component of error attributable to the relation between early season measurements of plant or other characteristics and final yields. But if these relations are subject to large errors, there seems no valid a priori basis for expecting condition reports to give a more reliable base for yield estimation. As the crop matures, yield estimates based on objective measurements should become more precise—a claim which is also made for the present methods. The objective procedure, however, has the advantage that the precision of the resulting estimates is measurable.

The conceptual problems arising in the measurement of employment are of a different nature. The reporter is asked to report employment on his own farm and is given some fairly specific guides to help him determine who is and who is not employed by definition. Current schedules define as employed during the survey week all operators who do any work at all, all hired workers who work 1 hour or more for pay, and all unpaid family members who work 15 or more hours. Those who have had occasion to work with farm employment data are aware of the marked consistent discrepancies between the Department's current estimates and those currently released in the monthly Report of the Labor Force by the Bureau of the Census. Although basic differences in sampling method underlie the estimates by the two agencies, it is a reasonable presumption that a significant part of the discrepancy is explainable by conceptual differences in the magnitudes being estimated. It is not the purpose here to support the Census concepts over those used by the Department. A recent article by Johnson and Nottenburg, however, contains valid criticism which suggests that employment estimates in the form now published are not directly usable in most significant research problems in agricultural economics.[8]

PROCESSING OF DATA

The opportunity afforded for the injection of personal judgment into the estimates at all stages of data processing is clearly revealed in current official descriptions of the procedures employed. Selected direct quotations representative of the many which might be cited will serve most effectively to depict the subjective nature of the process from the initial point of "editing" the data through the expansion of sampling indications into universe estimates, and finally to the final revisions based on supplemental indications.

Editing.—Editing is clearly an essential function in the processing of data collected from individuals whether it be a sample survey or a complete enumeration. The real editing function is served only when editing is performed within a formally prescribed set of rules designed to rule out unusable schedules or render them usable where the difficulty is remediable without distortion through straightforward conversions of units of measurement, etc. A somewhat different concept of editing is implied by the following quotation from a recent Department of Agriculture publication:

"Editing is necessarily a rather subjective operation, but when done carefully by a technician who is thoroughly familiar with what is being reported, the geographical area involved, and the type of frequency distribution that can reasonably be expected, it is a safeguard against errors which otherwise almost certainly would occur."[9]

The highly subjective nature of the "editing" process is illustrated by the following description of procedure in the State offices, with specific reference to the general crop report. Italics in all direct quotations are mine.

"(Each column on the schedule is scanned) to make sure that none of the entries therein differs so much from the others as to indicate either a misunderstanding on the part of the reporter, or a misplaced entry on the schedule, or an error in listing. *Even when no error of this sort appears to have been made, a report that is very different from the others from a given county may be deleted on the basis that*

[8] Johnson, D. Gale and Marilyn Corn Nottenburg. A Critical Analysis of Farm Employment Estimates. Journal of the American Statistical Association, vol. 46, June 1951, pp. 191–205.

[9] U. S. Department of Agriculture. The Agricultural Estimating and Reporting Services of the U. S. D. A. Miscellaneous Publication No. 703. Washington, D. C., December 1949, p. 11.

it is unrepresentative. Most questionable entries are either deleted or moved into the appropriate columns, but some that are apparently not attributable to misunderstanding or mechanical errors *may* be left in to represent minority situations in a given county." [10]

With reference to price estimates the "editing" function is likewise revealed as twofold: "(1) to detect, by inspection, errors made by the respondent in reporting prices, or by the clerk, in transcribing the data"; and "(2) *to review the reasonableness of the quotations reported and their comparability as a whole with previous reports.*" [11]

There is apparently no centralized control designed to establish and maintain uniform rules of editing throughout the system. But mere lack of uniformity may be considered a minor infraction of sound editing practice when compared with the faulty concept of editing which provides opportunity for indiscriminate pruning of extreme observations to force conformity to preconceived notions regarding the frequency distribution of observations and geographic and other uniformities.

Initial estimates.—Workers in the Department have long recognized the possibility of biased response to the voluntary mailed inquiry and have sought to adjust for this bias in the estimating procedures employed. In the late 1920's the graphic regression technique, involving, typically, the use of a scatter diagram between current estimates and final estimates over some past period was introduced and is used extensively today. These regression charts are usually employed in no prescribed formal way but are used along with other supplemental analyses in arriving at recommended estimates in the State offices and in the review of these recommendations by the Crop Reporting Board. In the estimation of crop yields from sample reported condition, for example, a scatter chart of final yield estimates in a previous period against sample reported condition in corresponding years is used as an aid in transforming current sample data into an estimate of yield. Other factors such as precipitation or trend may also be introduced to permit multiple regression adjustments. An important bit of supplemental information used in interpreting the sample indications is apparently the State statistician's personal appraisals of yield prospects based on his observations as he travels extensively through his State.

That this procedure carries through the review of the Crop Reporting Board is amply evident in the following official description, referring again to the crop report. "In the first, or State, review, a member of the Crop Reporting Board reads the (State) statistician's comments and using much the same techniques as followed by the statistician (in the State), *arrives at his own recommendation for each item.*" The State reviewer's recommendations are then submitted to the entire Crop Reporting Board, and "* * * using the same techniques which were used in the State office and in the State review, they (the Board) review the estimates for all States, approve or disapprove changes made by the State reviewer, *and make other changes if they believe the data warrant them.*" As a final step, "*All changes are then approved or disapproved by the Chairman of the Crop Reporting Board.*" [12]

Similar methods underlie price estimation. At the State level, "* * * the statistician reviews the entire set of data, compares price changes of similar or related commodities and in central markets, adjusts for known biases, using regression charts, and makes other comparisons or analyses that will help him evaluate the data." And in the review, "The Board considers the recommendations from each State in relation to the indicated averages and the level of reported prices in other States, keeping in mind usual geographic differences, relative degree of change since the previous inquiry, amount of change since the previous inquiry, amount of change shown by comparable price data from other sources, and available terminal-market price quotations." [13]

The specific nature of the evidence underlying the reviewers' revisions is not clear. From the description of procedure the possibility cannot be excluded that adjustments might be based on little more than a belief on the part of the reviewer that his revised estimate is somehow superior. Furthermore, the apparent attention given geographic and terminal market price behavior may well serve to generate significant relationships in the published estimates at this stage.

[10] Ibid., p. 11.
[11] Ibid., p. 116.
[12] Ibid., p. 12.
[13] Ibid., p. 117.

Another type of estimate apparently used extensively by the Department is the direct ratio or regression expansion. Claims of superiority of this form of estimate are offered along two quite different lines. The first is that in samples free from selectivity ratio or regression estimates frequently give more precise results than direct estimates. The increased efficiency is attributable to the fact that additional information, namely the relation between two universe variables—the variable, the mean of which is being estimated, and the control variable—is introduced explicitly into the estimating equation and, if the correlation is sufficiently large, a significant reduction in the variance of the estimate will result. The second and quite different claim is made that if samples are selective, this form of estimate when applied to a base relatively free from error frequently effectively to adjust for sample selectivity. This implies that a sample which is biased for purposes of direct estimates of livestock numbers, for example, may be significantly less biased for estimates of the ratio of livestock numbers this year to last year.

The Department's supporting literature cites no empirical evidence for either of these claims. With respect to the first, it must be recognized that the ratio or regression form of estimate may contain bias the magnitude of which is unknown and, hence, the increased efficiency suggested by reduction in the sampling variance may lead to a false sense of precision. Results of some experiments conducted with selected agricultural statistics in Ireland by R. C. Geary [14] suggest that for large samples ratio estimates work quite well. In stratified sampling, however, where the ratio is estimated from relatively small samples within strata, the implied gain might be misleading. With respect to the claim regarding adjustment for sample selectivity, the literature provides no convincing support. Confirmation or denial of this assertion can come only through continuing independent checks on individual estimates.

Revision process.—An integral part of the estimating work of the Department is the continuing program of estimate revision. This is important in the Department's estimating program since final revised estimates play a key role in many of the current estimates. Check data of varying degrees of accuracy become available at the close of each season, or at periodic intervals, which are used in successive revisions toward what is considered to be more accurate estimates. For some estimates, fairly complete check data become available at the close of the season. This is apparently true for production of such crops as cotton, tobacco, sugar beets, rice, peanuts, and flaxseed. For other cash crops, check data of varying degrees of completeness become available from supplemental indications of railroad movements, terminal market receipts, etc. For a number of crops, among them the major feed crops, heavy reliance is placed on the quinquennial census of agriculture and annual farm censuses in States where such censuses are taken. For certain other estimates, notably prices, the nature of the supplemental information on which revision is based is not clear.

Appraisal of the methods employed in the revision process is not possible since adequate accounts of the methods used have not been published. Current descriptions certainly leave a reasonable doubt as to whether the validity of a good deal of the check data is itself really known. C. L. Harlan writing with regard to the checks provided by the 1945 Census of Livestock concluded, "* * * it is apparent that the 1945 census enumeration of livestock on farms furnished an inadequate bench mark, either for revising the estimates for 1945 and preceding years or for projecting the estimates for succeeding years. But although the census totals in themselves are very questionable as giving a dependable level of numbers of the different species as of January 1, 1945, they were of material value to the Department of Agriculture in furnishing evidence for making new estimates of numbers that are closer to the actual numbers than were the old estimates." [15] The revised estimates as published are typically much closer to the Department's original estimate for January 1, 1945, than to the census enumeration.

From selected comparisons made by the writer between the Department's revised estimates and census enumerations of acreage, yield, and production, the role played by census data in the revisions is not completely obvious. For those field crops checked, it appears that yield estimates were very frequently adjusted to census levels in census years. Post-census adjustments in acreage

[14] Geary, R. C. Sampling Methods Applied to Irish Agricultural Statistics. Technical Series. Central Statistical Office, Dublin, September 1949.

[15] Harlan, C. L. The 1945 Census Enumeration of Livestock on Farms. Journal of Farm Economics, vol. 29, August 1947, pp. 691–710.

for census years were also evident though discrepancies typically remain between revised acreage and census data.[16]

The apparent practice of adjusting yield estimates to census levels in census years is probably not unreasonable. However, the census would seem to give little information which is useful for intercensus yield revisions. A census enumeration may call for a yield revision for a particular census year but the appropriate pattern of revision for intercensus years is not derivable from census yields. In addition something must be known regarding the trend of error in yield estimates over each period. Postcensus revisions of both yield and acreage for intercensus years were evident in the comparisons made but the revision procedure is not clarified by an inspection of the data. Those estimates for which annual supplemental data become available would appear to be on firmer ground for intercensus revision. However, until a great deal more is published concerning the precise nature of the supplemental data and the analyses underlying the Department's adjustments based on them, the user of the final statistics is at a loss to form even a subjective evaluation of the validity of the final estimates.

Failure of the Department's revisions of such magnitudes as acreage and livestock numbers to conform closely to census levels cannot be considered to reflect upon the accuracy of the revised figures. The difficulties in interpreting census data arising from such causes as underenumeration, lack of comparability due to shifting dates of enumeration, unknown interviewer error, etc., are familiar to all who have had occasion to use census data in research. It may be questioned, however, whether the cloud of uncertainty with regard to the validity of the original estimates is dispelled by references in the literature to census "bench marks" used in the revisions of these estimates. It is perhaps not inappropriate here to express the view that for a government otherwise economy minded with regard to the collection of statistics, the census seems an extremely inefficient method of collecting information. Recognizing that census data are neither timely nor free from error, it must be questioned whether much if any information is provided by the census that could not be obtained more efficiently by properly designed sample surveys.

CONCLUDING REMARKS

Considering the procedures employed by the Department from the initial collection of data through the final revisions of estimates, it is clear that the usual measures of sampling precision are not applicable for the bulk of the estimates made. Moreover, the user of these statistics is supplied with little convincing evidence regarding their accuracy. Assurances in the supporting literature that estimates are felt to be of "serviceable accuracy" are somewhat less convincing than would be a series of checks based on objectively designed surveys and objective procedures of processing the data. If continuing independent checks could be found to support the official estimates, a more rational basis for the continuance of present methods might be found.

The more objective surveys which have been conducted by the Department have generally been designed for special estimates not obtainable in the regular estimating program and not specifically as checks on estimates by regular methods. Although one purpose of the 1947 and 1948 enumerative surveys was to provide objective checks on official estimates at the national and broad regional levels, they have apparently not provided conclusive checks. Such comparisons as are available in print, however, do not show generally close agreement with official estimates.[17] Published accounts of objective experiments at the State level with acreage, yield, and production estimates in such crops as wheat, cotton, and corn likewise give no conclusive checks on official estimates.[18] The wheat surveys of 1939 and 1940 have been the most comprehensive, but checks on official estimates are clouded by the possibilities of bias in the objective estimates themselves.

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[16] The comparisons were with 1934, 1939, and 1944 census data as follows:
Winter wheat: Oklahoma, Kansas, United States.
Spring wheat: North Dakota, South Dakota, United States.
Corn: Iowa, Illinois, United States.
Oats: Iowa, Ohio, United States.
Barley: North Dakota, California, United States.
Rye: North Dakota, Minnesota, United States.
Soybeans (excluding 1934): Illinois, Indiana, United States.

[17] Senf, Catherine. A Report on the General Enumerative Surveys II. Agricultural Economic Research, vol. 1, October 1949, pp. 105–128.

[18] King, Arnold J., and Dale E. McCarty. An Objective Method of Sampling Wheat Fields to Estimate Production and Quality of Wheat. U. S. Department of Agriculture. Technical Bulletin No. 814. Washington, D. C. February 1942.
McCandless, D. A. Objective Sampling in Estimating Southern Crops. Journal of Farm Economics, vol. 23, February 1941, pp. 247–255.
U. S. Department of Agriculture. Agricultural Estimating and Reporting Services of the United States. Washington, D. C., ——, p. 18.

Objective counts as applied in cotton are apparently viewed more as supplemental indications than as checks on the estimates made by regular methods. An interesting experiment involving samples drawn from independent lists and an interview follow-up of a sample of nonrespondents conducted in some 25 States in 1948 suggested a rather consistent upward bias in estimates of April 1 grain stocks based only on response to the general schedule typically used for this purpose.[19] Other experiments in the form of special mailed surveys with repeated mailings or follow-up interviews of a sample of nonrespondents have provided interesting results which reflect the nature of the biases present in voluntary mailed inquiries.[20]

This experimentation in more objective methods has no doubt yielded suggestive results but the function which it has served in the regular estimating program of the Department is not clear. It is clear that from the assortment of objective experiments thus far conducted by the Department there emerges no systematic plan of objective checks on the large volume of important current estimates released.

Lacking such objective checks, the user of the statistics would be facilitated somewhat in his individual appraisal of the estimates by more detailed analytical accounts of the adjustments made in the processing of data from the initial collection to the final revised estimates. Analyses revealing the nature of and the basis for adjustments by State statisticians and members of the Crop Reporting Board might well be useful in appraisal of initial estimates. More complete reports of analyses of revision procedures are essential to the appraisal of revised estimates.

It must be considered doubtful, however, that more exhaustive analyses of estimates based on present methods will, in many cases, give the user more than a slightly more adequate basis for his own subjective appraisal of their accuracy. Although this is to be preferred to the present lack of supporting analyses, it must be considered as an inferior substitute for a shift to more objective methods.

The limiting factors most frequently cited to a shift to more objective methods are the familiar ones of time and costs. It cannot be denied that both elements are real. Yet, it is difficult for an outsider to determine to what extent the absence of significant progress in this direction is motivated by an underlying conviction that the methods currently used are sound. Objective research demonstrating clearly the need for improved methods might prove the most effective device for making both more time and more funds available. The time element may be somewhat overstressed. A premium might be placed on sample designs which would facilitate data processing in the time allotted though perhaps at some sacrifice of precision. Also, with more objective procedures, the time now spent in observation and review by the professional staff would be somewhat curtailed. It is even conceivable that the present rigid statutory regulations governing time of release of many of the estimates might be relaxed if the need were clearly established.

There is little doubt that a complete shift to objective estimation would be costly, but the economy argument should not be overplayed. Presumably farmers, handlers, and processors base important economic decisions on official estimates. Furthermore, Government action programs involving substantial expenditures of public funds are tied to the Department's official statistics. In view of the increasingly important role being played by official statistics, the time for basic and thorough reconsideration of estimating methods seems already past due.

Cost and other considerations probably mean that a complete shift to objective estimation will take time. During the interim period, a systematic program of periodic checks should be considered as a less costly alternative though perhaps at considerable sacrifice of information. Should resource limitations prohibit the immediate inauguration of an extensive program of periodic checks, a program of continuing objective checks on key estimates in selected States would seem the minimum acceptable if genuine progress in estimating methods is to be made. Although this more limited program is of questionable value for immediate improvement in estimates nationally, it does have the merit of providing really significant checks on present estimating procedures—a logical starting point for any program of improvement.

[19] Scholl, J. C., and C. E. Burkhead. Interviewing Nonrespondents to a Mail Survey: An Experiment in Connection With April 1948 Farm Stocks Report. Agricultural Economics Research, vol. 1, January 1949, pp. 16–23.

[20] Hendricks, Walter A. Adjustment for Bias Caused by Non-Response in Mailed Survey. Agricultural Economics Research, vol. 1, April 1949, pp. 52–56.

AGRICULTURAL AND MECHANICAL COLLEGE OF TEXAS,
DEPARTMENT OF AGRICULTURAL ECONOMICS AND SOCIOLOGY,
College Station, Tex., January 30, 1952.

Mr. JOHN HEIMBURGER,
Counsel, House Committee on Agriculture,
House of Representatives, Washington, D. C.

DEAR MR. HEIMBURGER: I have your letter of January 25 and read with much interest what you have to say about the subcommittee on agriculture which has been set up to study the crop reporting and estimating services of the Department of Agriculture. I appreciate the invitation to attend these hearings and wish it were possible for me to do so. Our out-of-State travel is so limited, I hesitate to ask our director for funds for out-of-State travel since at a recent meeting he informed us that we had already exceeded our allotment for the last quarter on out-of-State travel and would be necessary to curtail this travel very materially.

I am keenly interested in what your committee is doing and do want to take this opportunity to make some brief observations. I think Dr. Well's statement regarding the difficulty of forecasting weather conditions and their effects on production should be emphasized. The weather factor becomes more and more important in forecasting yields as you move into regions and areas subject to rather sudden and violent fluctuations. I have seen the prospects for a wheat crop in Texas look very dark at the seeding time but finally see it turn up with a bumper crop. On the contrary, I have seen great promise of a good yield at the seeding time and on through the early stages of the crop and in the end a failure.

I hope your committee will give serious consideration to the need of strengthening agricultural statistics at the local level. I believe this must come before agricultural statistics on a State and national level can be greatly improved. We have tried to do something about this in Texas through our agricultural statistics committee but so far, we have not been very successful. I am attaching a brief statement on localized agricultural statistics for Texas which I believe expresses our thoughts in this connection. Eugene Butler, editor of the Progressive Farmer, Dallas, Tex., has served as chairman of our committee. If you have not already, you might want to contact Mr. Butler in this connection. I believe that the need for improvement in this connection is great enough that the Federal Government would be justified in providing some incentive to States for the purpose of localizing agricultural statistics.

As a final work, I would like to stress the importance of having our agricultural statistics provided by a neutral group or agency such as the Department of Agriculture. Such an agency I believe can best serve the interest of both agriculture and industry. The techniques used in forecasting may not be adequate for all situations but I am sure that your committee is interested in helping the Department of Agriculture improve its techniques and intensify its activities to such an extent that the information provided will be much more applicable both in the field of agriculture and industry.

With very best wishes to your committee in its effort to improve agricultural statistics and especially at the local level, I am,

Sincerely yours,

L. P. GABBARD, *Head of Department.*

LOCALIZED AGRICULTURAL STATISTICS FOR TEXAS

This is an attempt to present some pertinent points having a bearing on the subject in the following order: (1) the need; (2) what is being done to meet the need; (3) why more is not being done; (4) what is needed to do the job adequately; and (5) an outline of tentative plans for the project.

(1) Unquestionably, the need for county and area agricultural statistics within the State is greater in Texas than in any other State, because of the size of the State and extreme variations between areas. State figures are less useful because of the many distinct areas, which often develop offsetting trends that are obscured in State figures. Research workers, administrators, industries in the State, as well as those looking into possibilities of coming into the State, are seriously handicapped in their work by the lack of adequate data on where in the State and in what quantity the commodities or items are located. The need is for not only basic county and area statistics on crop acreages and production and livestock numbers, but also for pertinent information by areas on prices received, disposition of products, farm machinery and other equipment (number of tractors, combines, etc.), farm population, labor force, wages, farm and ranch

family living items, land utilization as bearing on potential development, and many other aspects of the agricultural economy on which information is quite inadequate at present. Numerous requests are received for information along these lines from people who have a real need for such data—the availability of which certainly would benefit the State. The effectiveness of present programs for the improvement of agriculture and industry within the State could be greatly increased by making available adequate local statistics for agriculture.

(2) The development of county or area statistics to meet the needs outlined in the foregoing paragraph has been limited to improving county and area approximations (some of them hardly estimates) for just a few crop items, for which incidental information could be developed from the activities of some agency operating on a county level. For instance, AAA individual farm-work sheets provided useful, supplemental data which made possible the preparation of county figure on wheat, cotton, peanuts and rice. These are the only items for which annual county figures have been prepared and published.* Recent changes in AAA (PMA) programs remove the possibility of supplemental crop acreage data being developed from that source, and it may not be possible to continue the publication of even the approximations for these crops. It has not been possible to estimate any livestock items on a county basis.

The State definitely is lacking in county and area data on its agricultural resources, compared with what is available in other important agricultural States—to an extent not in keeping with Texas enterprise and initiative in other matters.

(3) It is generally recognized by the United States Department of Agriculture that there is an urgent, unfilled need, particularly from within the State, for county and area statistics on most agricultural items. Appropriations to the Federal Department for agricultural statistics, however, are intended and designed to provide for National and State data only, and the development of detail by counties and areas within the State necessarily has been considered a State function, supplementing Federal activities, to meet the need for detail within the State. Sample individual farm data upon which State estimates are based, as well as personnel and other facilities for handling the State reports, are inadequate for a comprehensive program of county statistics. Such a program would call for a larger sample of individual farm data and more representative data than it is possible to obtain by mail inquiries, and with facilities available in the Federal office for the State. All States which have adequate county statistics make substantial appropriations to supplement Federal facilities in the State for the specific purpose of providing agricultural statistics in greater detail. These State appropriations are made to a State agency, for use in a State-Federal cooperative crop reporting service. There are cooperative arrangements of this kind in 40 States, but there is no formal cooperative set-up in Texas.

(4) A comprehensive program of agricultural statistics by counties and areas would necessitate a systematic, scientific, continuing program for obtaining representative individual farm sample data in volume, and a staff of technical and clerical workers for developing and interpreting the sample data in terms of county and area totals. Several approaches for getting individual farm data have been suggested by persons interested in the development of a State program. It is natural and proper that existing facilities in the counties should be considered first in reviewing possibilities. Among possibilities suggested are the county agents, PMA (AAA) county personnel, vocational agricultural teachers, and county assessors.

These agency representatives can and, no doubt, will be helpful under any plan for getting basic sample data in the counties. County agents and PMA county personnel have been very cooperative and helpful in other sampling surveys being made by the Federal Department in the selection and training of qualified enumerators. They have other full-time duties, however, in an educational rather than a data gathering capacity, and it would not be feasible to add the heavy assignment of making systematic farm surveys to their already full programs. Vocational agricultural teachers and other teachers have been interested in serving as enumerators in other sampling surveys. They like the work and they need the money, but as a whole, they are too busy with teaching and civic duties to undertake it. In a number of north-central (Corn Belt) States and in North Carolina, tax assessors gather information on crop acreages at the time farmers make their tax return. The result is a partial census, with the degree of completeness unknown. The results are good in some States where the assessors strongly back the plan, but in many States, the results are unsatisfactory. Where the assessors are well paid for the extra work, the results are best, but the surveys to obtain reports on all farms are quite expensive. Where

they are not well paid for the extra work, they do a poor job and results are unsatisfactory—as might be expected. Systematic, scientific sampling to get a useful sample at minimum cost is impracticable through tax assessors. An assessors' census of agriculture was attempted in Texas in 1931, with widely varying results between counties. The law providing for the survey was repealed after 1 year's trial, because of extreme opposition from the county tax assessors. It is not believed that an assessors' census of agriculture would be successful in Texas or in any other southern State.

Under none of the approaches discussed heretofore would it be possible to set up and follow a systematic scientific, continuing program throughout all counties for obtaining the necessary farm and ranch data for county and area estimates. One important factor missing is the proper training and control of field enumerators by those reponsible for the final end-product estimates.

(5) For developing individual farm sample data in the preparation of county and area agricultural statistics, it is proposed that a plan of enumerative sampling be followed, corresponding to and supplementing enumerative surveys being made at this time in a limited number of counties by the United States Department of Agriculture. The areas enumerated in each county would be segments from the "master sample" as designed by the United States Department of Agriculture for the country as a whole. Under this plan, by the use of very detailed maps, counties are divided into subareas, which are in turn divided into relatively small segments with just a few farms in each segment. These subareas and segments are numbered and certain numbers selected to form the sample. The sampling process is a bit complicated, but necessarily so to make sure that all the many different kinds of farms in the county are represented in the sample in the right proportions. Trained enumerators or interviewers would then be assigned to visit every farm in each of the sample segments.

The enumerators would be selected from within the county where possible, and hired on the same basis, at the same rate of pay and with the same travel allowances, as the enumerators doing similar work on the strictly Federal projects being made in a small number of the counties. In counties where Federal surveys are being made, the same enumerators would be used.

The rate of pay for enumerators at present on the Federal surveys is about $1.15 per hour, and the same rate should be paid those working on the State portion of the job—inasmuch as it is supplementing and in some counties part of the job being done by the Federal Department. In each county, with the help of county agents, AAA officers and others, the best qualified persons interested in doing such work will be selected. Most of them probably will be farmers or farmers' wives who at certain seasons have time for such work—and it has been the experience of the Federal Department in similar surveys on a more limited scale that capable, high-type persons are interested in the work at the rate paid.

It is anticipated that a State appropriation for the project would be made to the Texas Agricultural Experiment Station, as the project would be closely related to research in agriculture, and there is a possibility that funds so appropriated would qualify as matching an equal amount of Federal funds under the Flannigan-Hope Act. The State funds provided would be used by the experiment station office in a Federal-State Cooperative Statistical Service, for which the details of operation would be covered by a formal cooperative agreement between the experiment station and the Bureau of Agricultural Economics of the United States Department of Agriculture. Sampling procedure, the hiring and training of enumerators and other personnel, and the preparation and publication of estimates would be under the direction of the Federal statistican of the United States Department of Agriculture for Texas, who would be in charge of the Federal-State Cooperative Statistical Service. The present facilities of the State office of the BAE of the USDA would contribute to and become the Federal part of the Service, and the Washington office of the Department would be called upon freely for technical assistance in designing the sample and in the preparation of detailed maps to be used by enumerators.

It is estimated that the Service to provide county and area statistics on crops and livestock numbers, and supplemental data relating to prices, equipment, land utilization, farm population, etc., would require a supplemental State appropriation of about $100,000 in addition to Federal facilities now available. Of this amount, about $70,000 would be for enumerative costs in the counties, including enumerator pay, schedules, instruction area supervisors, etc., about $20,000 for additional technical and clerical help, and $10,000 for other office expenses, such as files, machines, telegrams and telephone, printing, travel, and special inquiries.

UNIVERSITY OF ILLINOIS,
COLLEGE OF AGRICULTURE,
DEPARTMENT OF AGRICULTURAL ECONOMICS,
Urbana, Ill., February 4, 1952.

Mr. JOHN J. HEIMBURGER,
Counsel, Committee on Agriculture,
House of Representatives, Washington, D. C.

DEAR MR. HEIMBURGER: Thank you for your invitation to attend the hearings on the crop estimates work. It would be impossible for me to attend these hearings. The Division of Crop and Livestock Estimates has over the years built up an efficient corps of men and has steadily extended the scope of its work. If I were to criticize, it is that they have become too tied to routine statistical inquiries as the bases for their estimates. In this general field they have made improvements but this approach is inclined to cause them to take a too narrow look at things.

They need to supplement these statistical reports by the findings of some well-trained men who make independent reports from continuous first-hand observations in the field. These men would be in contact with the crops and the men who grow them—men who know what is happening to their crops. These men should report independently to the desk statisticians who summarize the results of the routine reports. They should report right down to the date when the estimates are made. What the people who use these reports want is the latest information—not necessarily that which applies on some specific date, namely October 1.

I believe that if well-qualified men were in the fields with the crops, the conditions which caused the errors in the reports which precipitated your investigation would come to the attention of the crop estimates people earlier.

The statisticians would probably say that what I am suggesting is to turn the clocks back to the days of the earlier crop estimates. But as a supplement and check on the methods which have been developed in recent years, use of the older system in which well-qualified men who kept close touch with a few well-informed people and with conditions in the field would be worth while.

Very truly yours,

L. J. NORTON,
Professor, Agricultural Economics.

PURDUE UNIVERSITY,
SCHOOL OF AGRICULTURE,
DEPARTMENT OF AGRICULTURAL ECONOMICS,
Lafayette, Ind., February 4, 1952.

Mr. JOHN J. HEIMBURGER,
Committee on Agriculture, House of Representatives, Washington, D. C.

DEAR MR. HEIMBURGER: This is in reply to your letter of January 25 relative to the study of the crop reporting and estimating services of the USDA now being done by the subcommittee on agriculture.

I appreciate very much your invitation to present any testimony I may have before the committee, or if unable to testify, to submit any suggestions I may have.

Frankly, it has been my personal observation and belief for some time that the Division of Crop and Livestock Estimates of the Bureau of Agricultural Economics does some of the most objectives and most valuable work of an economic character done in the Department of Agriculture. I feel that my views on this are shared by most of my colleagues in the Department of Agricultural Economics at Purdue University. Based on the acquaintances I have with personnel in this division in Washington, and in some 8 or 10 State offices, I am convinced that these men have a passion for objectivity and accuracy in their work.

Obviously, accuracy is a relative term. The very name of this section implies that their reports are based on "estimates." Even so, we feel they have a rather remarkable record for accuracy through the years. I am aware that the estimates during 1951 on United States cotton crop were revised down markedly as the season progressed, and I am also aware that rather substantial adjustments were made in the estimate of the corn crop as the season progressed. However, this does not mean that the estimates were inaccurate. It probably means that the crop prospects deteriorated as the season progressed, as a result of weather, abandonment, and other causes. So far as I am aware, only the Lord himself can forecast changes in the weather in the latter part of the production season. We should not hold the division of crop estimates responsible for this.

I think it is well for the Committee on Agriculture to take a look at the crop reporting service, to see if there is some way to improve the service. You will probably end up by discovering that the accuracy of predictions could be improved somewhat if the number of observations were increased. This, of course, calls for additional appropriations. (That seems to be a patent answer to most of our problems).

Within the framework of the existing resources available to the division, those of us at Purdue University feel that the division is doing about as good a job as can be expected. At least, we are convinced that they are technically competent, sincere, and objective. That's all we can ask.

Sincerely yours,

EARL L. BUTZ, *Head of Department.*

UNIVERSITY OF KENTUCKY,
COLLEGE OF AGRICULTURE AND HOME ECONOMICS,
AGRICULTURAL EXPERIMENT STATION,
Lexington 29, Ky., February 8, 1952.

Hon. JOHN J. HEIMBURGER,
Counsel, Committee on Agriculture,
House of Representatives, Washington, D. C.

DEAR MR. HEIMBURGER: This is reply to your letter of January 25, with reference to the subcommittee of the House Committee on Agriculture's interest in techniques and methodology used by the Bureau of Agricultural Economics in its crop reporting program.

Unfortunately a very heavy schedule would make it very difficult for me to appear before the committee in person to make a statement but I would like to make a few general observations about the crop reporting service for whatever these observations may be worth.

I believe I would say categorically that the Bureau is making a sincere, conscientious effort to provide as accurate forecasting information on crop and livestock production as is feasible, and taking account of all of the variable factors I believe they have done a pretty good job.

Since additional information is being acquired in the field of theoretical statistics from time to time, if your committee would ask either the statistical laboratory at Ames, Iowa, or Raleigh, N. C., to objectively appraise the crop reporting statistical sampling procedure and methodology, I believe you would get an unbiased, thoroughly competent appraisal of the program. Furthermore, if the Bureau had some additional funds to carry on experimental work in the field of sampling and in a constant study and appraisal of their techniques and methodology, I believe this important service might be somewhat improved. I would hope, however, that any additional funds used used by BAE in this particular area would not be drawn from inadequate funds now used by the Bureau in economics studies that are very important to American agriculture.

The accompanying table indicates the relative accuracy of estimates of burley tobacco production since 1927. You will note that there are about as many deviations over as under and taking account of the fact that forecasts must always be based on good judgment, it is a little difficult to think that the accuracy can be improved on.

I am not sure these general observations will be helpful to you but if you want a scientific, critical appraisal of the techniques and methodology of the crop reporting program, I suggest you consult the heads of the statistical laboratories at Ames, Iowa, and Raleigh, N. C.

Sincerely yours,

FRANK J. WELCH, *Dean and Director.*

U. S. Department of Agriculture estimates of burley tobacco production as of Nov. 1 and the revised estimates after sales data are available

Crop year	Number estimate (thousand pounds)	Final estimate (thousand pounds)	Error in November estimate	
			Thousand pounds	Percent
1927	202,942	176,227	+26,715	+15.16
1928	260,466	269,136	−8,670	−3.22
1929	300,508	337,415	−36,907	−10.94
1930	305,089	349,212	−44,123	−12.64
1931	468,502	424,751	+43,751	+10.30
1932	334,646	303,739	+30,907	+10.18
1933	413,893	377,513	+36,380	+9.64
1934	301,336	252,187	+49,149	+19.49
1935	247,732	222,069	+25,663	+11.56
1936	216,632	220,384	−3,752	−1.70
1937	361,927	402,197	−40,270	−10.01
1938	392,490	339,218	+53,272	+15.70
1939	350,669	395,263	−44,594	−11.28
1940	321,230	376,644	−55,414	−14.71
1941	338,730	336,837	+1,893	+.56
1942	339,817	343,534	−3,717	−1.08
1943	390,165	392,106	−1,941	−.50
1944	488,480	590,581	−102,101	−17.29
1945	601,322	577,156	+24,166	+4.19
1946	611,634	614,004	−2,370	−.39
1947—November	525,206			
December	518,390			

CORNELL UNIVERSITY,
NEW YORK STATE COLLEGE OF AGRICULTURE,
AGRICULTURAL EXPERIMENT STATION,
Ithaca, N. Y., February 8,1952.

Mr. JOHN J. HEIMBURGER,
Counsel, Committee on Agriculture,
House of Representatives, Washington, D. C.

DEAR MR. HEIMBURGER: In Dean Myers' absence we are replying to your letter addressed to him. We believe the comments expressed in this letter reflect Dean Myers' views concerning the needs for and use of factual information issued by the Crop Reporting Board.

Crop reporting is one of the oldest and most fundamental services of the Department of Agriculture. The data gathered from farmers and summarized and published by the Department has long been used here in the New York State College of Agriculture in our research and educational work. We are convinced that the results of the crop reporting activities have been instrumental in helping to develop our agriculture along sound economic lines. It is appropriate for a committee of the Congress to look into this field of activity from time to time and we welcome this opportunity to accept your kind invitation to comment on it.

New York State's farmers are of course only indirectly interested in cotton but are interested in the crop reporting service in general. For example, the Northeast is a big deficit area with respect to livestock feed, importing into New York State alone approximately 2 million tons per year of grains and other byproduct feeds to maintain our cattle, poultry, and other livestock population. Month-to-month estimates during the growing season of the grain crops in the Corn Belt are of vital significance to our farmers. Again, the reports of prospective potato production in competing regions of the United States and in Canada are highly useful. Estimates of the crops and livestock within our own State are of increasing importance to us in our educational work.

It is hoped that through your investigation further improvements and refinements in our existing crop reporting system can be made. This is progress. Our extended experience with the data issued by the Crop Reporting Board indicates that the figures have been reasonably accurate over the period of years. Knowing the nature of this farmer reporting and some of the inherent limitations, we have avoided overuse of the figures which may have occurred elsewhere.

As our Nation's agriculture becomes increasingly commercialized and specialized, along with the rest of the economy, we as a people want and demand increasingly accurate information about this industry, both by individual enterprises and by areas of production. This is all to the good. It does mean that as

we move in the direction of more refined data, particularly by smaller geographic areas, there is increasing need, we believe, to supplement crop and livestock reporting by farmers with more personal interviews in random sample areas of the agricultural economy. This will, of course, require additional funds. Perhaps your investigation will help to crystalize the thinking as to when more of this supplementary work should be added to the present system.

Yours truly,

L. C. CUNNINGHAM,
Professor of Farm Management.
M. C. BOND,
Professor of Marketing.

UNIVERSITY OF FLORIDA,
STATISTICAL LABORATORY,
Gainesville, Fla., February 12, 1952.

MR. JOHN J. HEIMBURGER,
Counsel, Committee on Agriculture,
House of Representatives, Washington, D. C.

DEAR SIR: I am in receipt of your letter of February 6, concerning the hearings on the cotton and other crop estimates and forecasts, in which you ask three questions and invite me to appear before your committee. I regret that our statistical laboratory has no funds available for travel outside Florida; in any event, I doubt if I could add anything to the testimony which no doubt has already been presented to your committee.

In answer to the specific questions contained in your letter, I submit the following:

Question 1. What was the cause of the discrepancy between the September and November estimates of cotton production as issued by the Bureau of Agricultural Economics? What do you believe might be done to avoid such error in the cotton estimate in the future?

Answer. The unusual weather—quite different from average conditions—undoubtedly was the principal cause for the drop in the cotton forecast from September to November. The early yield forecasts are made on the assumption that average weather conditions will prevail for the balance of the year following the forecast. This was evidently not the case last fall. The other cause was apparently an overestimate of the acreage of cotton for harvest.

The estimation of the acreage of crops is one of the most difficult problem facing the Crop Reporting Board, not only for cotton but even to a greater extent for other crops, on account of the bias generally found in the farmers' reports received by mail. When the bias is fairly constant from year to year, which is generally the case, it can be allowed for through proper statistical procedures, but when a great change occurs, as was the case in 1951 the relation between the acreage as reported by farmers and the true acreage is quite different from the relationship usually found. This makes it extremely difficult to estimate the true acreage.

I have long advocated the use of what is usually called "objective methods" for measuring changes in the acreage of cotton and other crops; also for measuring changes in the numbers of livestock on farms. These methods include the periodical visitation to farmers in a scientifically drawn sample of farms to obtain data by personal interview and for crops, the extensive use of the crop meter and the close examination of the growing plants quite frequently during the growing season to measure the effects of weather. Experiments conducted along these lines in recent years have fully demonstrated the value of these methods. Unfortunately this type of approach is much more expensive than where the information is collected almost wholly by mail.

However, the answers to questionnaires obtained by mail tend to be quite selective and frequently fail to reveal the true situation because of the failure to secure reports from what might be called the lower strata of farmers, i. e., those who lack the necessary education to understand and fill out the questionnaires sent to them. The only way to obtain information from this group, which in some areas is quite large, is by personal interview and observation. The changes they make in their acreage may be and often are quite different from the farmer who fill out and return the questionnaires. The reporters tend to be the more wide-awake farmers who keep up with the times.

Question 2. Has your research disclosed a substantial margin of error in any other Bureau of Agricultural Economics statistics and if so, which statistics in particular?

Answer. The statistical laboratory at the University of Florida is only a little over a year old and it has not done any specific research in the crop estimating field so far. Last fall, however, the citrus industry of Florida asked the laboratory to investigate to see what could be done to improve the estimates of the citrus crop, which last year was underestimated by about 6 percent. This was due in large measure to the fruit being of larger size then usual. At the same time the Industry contacted the Bureau of Agricultural Economics' statistician at Orlando. He suggested the calipering of the fruit each month on a sample basis, also the personal visitation periodically to a good-sized sample of nonrespondent growers, i. e., those who fail to return the questionnaires sent to them. The laboratory concurred fully in these suggestions and so informed the industry. As a result State funds were made available to carry out the program during the current season. The results will not be available until the season is over.

Question 3. What can be done to improve the accuracy and value of the Bureau of Agricultural Economics' statistics and reports—generally and specifically?

Answer. The laboratory does not feel that a great deal can be done to improve the accuracy of the forecasts and estimates with the methods now employed and that to put the estimating and forecasting procedure on a basis where the latest and best statistical techniques can be fully employed would require a considerable increase in the funds devoted to the forecasting and estimating phases of the Bureau's work. This latest technique is the use of probability sampling.

I know from my long experience as Chairman of the Crop Reporting Board, that the statisticians engaged in the crop and livestock reporting work are a conscientious, well trained group, devoted to their work, and that they avail themselves of every opportunity to improve the accuracy of the forecasts and estimates on which they work. But the methods which meet the standards of the best statistical procedures are much more expensive than when data are wholly collected by mail; and while the statisticians engaged in this work are familiar with the newer methods, they are handicapped in their use and application by the lack of proper data to which they can be applied and by the expense of collecting same.

If your committee needs any further information which I am in a position to furnish, please let me know.

Very truly yours,

W. F. CALLANDER,
Director, Statistical Laboratory.

THE UNIVERSITY OF NORTH CAROLINA,
INSTITUTE OF STATISTICS,
Raleigh, February 28, 1952.

Mr. JOHN J. HEIMBURGER,
Counsel, Committee on Agriculture,
House of Representatives, Washington, D. C.

DEAR MR. HEIMBURGER: With reference to your letter of February 6 and our reply of February 12, I shall outline some of the research on crop estimates in which we have been engaged.

I should like first to mention that we have now a contract with the Bureau of Agricultural Economics and have worked cooperatively with that agency since the inauguration of our statistical unit in 1940. In fact many of the personnel of the BAE were instrumental in getting the Department organized and our association over the years has been one of mutual benefit and respect.

In your letter you have listed three main questions which I shall consider in order.

Question 1. What was the cause of the discrepancy between the September and November estimate of cotton production as issued by the Bureau of Agricultural Economics? What do you believe might be done to avoid such an error in the cotton estimate in the future?

We have no information of our own on which to base an answer to the first question and any comments we could make without an exhaustive investigation would be pure speculation. However, we should like to make a few points in general which could apply to any type of estimate.

(i) Inferences drawn from data from any sample cannot be made with certainty no matter how well the sample has been designed. In a strict probability sample in which procedural errors are kept at a minimum, the reliability of the sample can be calculated and limits of accuracy established—with a specified risk of being wrong. This risk can be made very small indeed but, if you keep making estimates long enough, the laws of probability will catch up with you and one of

your estimates will result in a "bust." With the hundreds of estimates made by the BAE it would be surprising indeed if a few were not "poor."

(ii) The comments under (i) apply to the most ideal situations theoretically. The budget under which the BAE operates does not permit the use of objective probability samples. The data are secured from farmers who will report by mail, which group is admittedly not a random sample. The results are therefore biased and adjustments are necessary. These adjustments are usually made by considering the relationship between their (the farmer's) answers at this particular time of the year, say September, and the "true" or revised answer at the end of the season. Over a period of years, an established relationship appears to have validity but the procedure introduces another chance for error in the estimates in addition to that outlined in (i).

(iii) Especially is the error outlined in (ii) apt to occur if some factor upsets the relationship or causes unusual deviations from the trend. Without the advantages of a probability sample it is extremely difficult to evaluate the effect of unusual weather conditions, excessive abandonment or in fact extreme conditions of any kind.

An objective probablity sample would of course be a step in the right direction in avoiding gross errors in future cotton estimates. However, I should like to emphasize that even if money were available, probability samples cannot guarantee that large errors will not occur occasionally.

Question 2. Has your research disclosed a substantial margin of error in any other Bureau of Agricultural Economic Statistics and if so, which statistics in particular?

In the comments under question 1, I did not mean to imply that the estimating procedures could not be improved. Improvement is always possible, even under the existing budgetary restrictions. The BAE is and has been aware of the potential gain from research in crop and livestock estimation; in fact this appears to be the only cogent reason from their standpoint of continuing the arrangement they now have with us.

The BAE desires to check their estimates with figures from as many independent sources as possible. One of the main bench marks is, of course, United States Census data. Sometimes Census checks are not available and even so it may appear desirable to have still another objective measure. These measures may be probability samples drawn for the purpose. I should like to briefly describe two projects along these lines. Both investigations were begun in 1949.

(i) *The 1949 North Carolina grain survey.*—The advent of hybrid corn, and especially its migration southward, had upset this relationship described in (ii) under question (1). Although this factor had been taken into account in their estimates, BAE wished to obtain an objective estimate of the yields of corn per acre in North Carolina and Virginia. Cooperatively, statisticians from the BAE, Virginia Polytechnic Institute, and this Department agreed on a sampling design which was carried out in the two States. The North Carolina data were tabulated and summarized by the Institute of Statistics. The survey estimate of yield per acre was higher than either BAE or subsequent United States Census figures while our (survey) figure for corn acreage was considerably below the BAE and Census figures. Oddly enough the survey and BAE estimates of total State production were quite close, i. e., the differences in yield and acreage were compensating. Some of the difference is explainable; the remainder is not. Part of the difference arose from the fact that the survey yields were "in the field" and took no account of harvesting losses while BAE estimates adjusted for this loss. There are some features of the survey (e. g., a suspicion of underestimation) and perhaps some differences in definition which prevent us from recommending our estimates per se and which prevents the BAE from accepting them without reservation. This is an area where more research is needed to explain the apparent discrepancies. The survey design and results are given in detail in Institute of Statistics Mimeo Series No. 40, 1950.

(ii) *A study of agricultural price statistics in North Carolina.*—The general objective of this investigation along with the reason for its being undertaken is expressed in the first paragraph of Mimeo Series No. 42, 1951, I—introduction, A. General preface. I quote:

"In American agricultural price statistics the word 'statistics' has retained much of its original meaning, i. e., a compilation of data useful in the administration of the State. The Government, probably the largest consumer as well as the largest producer of agricultural price data, has been confronted with the continuing task of testing its procedures in the light of advances in statistical methodology. In one of the early evaluation studies, published over 20 years

ago, Sarle observed, 'The data published by the United States Department of Agriculture are too often taken for granted by the research worker, largely because the reliability and adequacy of the data have never been fully analyzed.' While this situation is less serious today than it was when Sarle wrote, there is still truth in his words.

"The study described here was undertaken by the Institute of Statistics of the University of North Carolina under Research and Marketing Act funds at the invitation of the Bureau of Agricultural Economics for the purpose of securing an objective evaluation of certain price data and of the methodology by which they have been collected historically. Such an evaluation seems particularly appropriate in view of the increasing importance of the administrative decisions which public programs have placed upon these data."

Again, on page 195, V. Conclusions, summary, recommendation, under conclusions, I quote:

"(i) BAE estimates of mean prices, based on mail questionnaires and allied methods, were from 2 to 3 percent lower than estimates from this study, based on direct interviews of a sample of respondents.

"(ii) For research purposes involving analysis of sources of price variability (not one of the primary purposes of the regular BAE price reporting program), BAE specification of commodities, especially those bought by farmers, did not produce data capable of supporting more than the simplest analysis.

"(iii) For the periodic multiple-commodity surveys, average over-all field cost per schedule was $1.06; per schedule field cost of data taken from dealers was $0.77, and, from farmers, $4.81."

On the average, there was remarkable agreement between BAE and survey estimates of prices. Note with respect to (iii) the cost per schedule of probability—interview sampling.

These are examples of the kind of information we have and of the type of research we have undertaken at the request of the BAE. Our intent and purpose has been aimed at improvement of the methods; the degree of agreement between the estimates is but the first step.

Question 3. What can be done to improve the accuracy and value of Bureau of Agricultural Economic statistics and reports * * * generally and specifically?

We have three main suggestions to make regarding this question, none of which may be popular since their adoption and effectiveness hinges on budget increases.

(i) Strengthen the field offices of the BAE by providing them with an adequate number of well-trained personnel to do the job required. It is our opinion that the majority of the field offices are understaffed.

(ii) Use more probability sampling, at least to "true" up the adjustments of the mail data.

(iii) Adopt a stronger research program. Over 2 years ago, this office suggested a plan for strengthening the Bureau's research program. The BAE administrators appeared to be in accord, at least with the general objectives of the plan, but were again hampered by lack of funds. In connection with buying stocks, bonds, etc., I have heard the statement made, "Never invest money in any company that does not put at least 5 percent of its operating budget into research." I am convinced that the money put into research would pay for itself many times over in both increased accuracy and actual money-saving procedures.

Thank you very much for the opportunity you have given us to outline our thoughts in this problem.

Very truly yours,

GERTRUDE M. COX.

IOWA STATE COLLEGE OF AGRICULTURE AND MECHANIC ARTS,
Ames, Iowa, March 7, 1952.

Mr. JOHN J. HEIMBURGER,
House of Representatives,
Committee on Agriculture, Washington, D. C.

DEAR MR. HEIMBURGER: Reference is made to your letter of February 6, 1952, regarding the inquiry now being conducted by a subcommittee of the Committee on Agriculture on methods used by the crop estimating and reporting service of the Bureau of Agricultural Economics, United States Department of Agriculture. It was stated that "The committee would like very much to have made available to it any criticism, proposals, or suggestions which (I) believe would be relevant to this inquiry". Following this statement a list of specific questions was set out with a request for answers.

After careful consideration I should like to make the following comments and suggestions:

(i) The statistical laboratory of Iowa State College has for some years now engaged in a joint research program with the Bureau of Agricultural Economics, United States Department of Agriculture. This is also true of certain college departments, institutes, and laboratories at other land-grant and privately endowed colleges and universities; in particular, at the Institute of Statistics at North Carolina State College. Funds used to support this research are partially supplied by the Bureau of Agricultural Economics. Also certain staff members receive direct salary payments from the Bureau.

(ii) In view of (i) above and, if the subcommittee of the Committee on Agriculture believes that a serious inquiry is advisable, I venture to suggest that a committee of statisticians and economists, not in any way connected with the work or budgets of the Bureau, be appointed to furnish the subcommittee with an objective appraisal of the methods used by the crop estimating and reporting service of the Bureau. The services of the members of such a committee would have to be financed. Also such an investigation might very well take from 1 to 2 years.

(iii) In case the suggestion in (ii) is considered, I further suggest the following names of statisticians be considered as possible members of the committee: Frederick Mosteller, Harvard University; S. S. Wilks, Princeton University; Frederick F. Stephan, Princeton University; John W. Tukey, Princeton University; William G. Cochran, Johns Hopkins University; Holdbrook Working, Stanford University; William Nichols, Vanderbilt University; Theodore Schultz, University of Chicago; Gale Johnson, University of Chicago; Clifford Hildreth, University of Chicago.

Sincerely yours,

T. A. BANCROFT, *Director.*

NATIONAL COTTON COUNCIL OF AMERICA

MEMPHIS, TENN.

WASHINGTON 6, D. C., *April 8, 1952.*

Hon. THOMAS G. ABERNETHY,
Chairman, Special Subcommittee, House Agriculture Committee,
House of Representatives, Washington 25, D. C.

DEAR MR. ABERNETHY: Your request for an expression of the views of the National Cotton Council on the subject of United States Department of Agriculture crop estimates is very much appreciated.

The subject of crop estimates published by the Crop Reporting Board of the Bureau of Agricultural Economics was discussed by the council's committee on production and marketing at the annual meeting in New Orleans in late January 1952. This committee is comprised of representatives of each segment of the raw cotton industry.

The committee recognized the important role that crop estimates play in our marketing system. It also recognized the many variable factors that must be considered in calculating an estimate. The committee was in complete agreement that in normal years the Crop Reporting Board has done an exceptionally good job in forecasting crop production; however, it feels that in abnormal years such as 1951 when acreage was substantially increased and rapid deterioration was very significant during the growing season, that the present system is not adequate to indicate or measure quickly these or other variable factors. It should be pointed out that it is not the intent of the committee to criticize the Crop Reporting Board, but it did wish to point out these defects in the present system with which we feel the Crop Reporting Board is already fully aware, but has not corrected presumably because of restriction by law or by budgetary limitations.

Since the cotton industry relies heavily on production estimates, particularly during the fall when most farmers are selling their cotton, the council strongly feels that every effort should be made to improve the accuracy of these reports. There needs to be a more widespread understanding that the monthly reports made from August to December are only forecasts as to eventual size of the crop assuming normal conditions following each forecast. No crop estimate can ever be accepted as precise measure of a crop. We do believe, however, that the application of known, as well as new techniques and improved methodology can substantially improve the degree of accuracy of these forecasts, particularly in abnormal years.

In recognizing the importance and desirability of more accurate estimates, the delegate membership of the council unanimously adopted the following resolution at its thirteenth annual meeting: "That the council support financial and technical measures designed to increase the accuracy of the USDA crop estimate reports."

At the present time, our thinking is that the approach for improvement of the crop report should be along the following lines: (1) Review of the legislation to determine if any of its provisions unnecessarily limit the effectiveness of crop estimates. Specifically, it seems to us that the July 1 report should be an estimate of acreage planted, similar to other field crops instead of acreage in cultivation on July 1. (2) Improvement of administrative procedures and methodology which may effect accuracy of report. In this connection we feel it would be desirable to estimate actual abandonment as of August 1, rather than assuming an "average historical" abandonment factor for developing this first production estimate. Had abandonment been recognized as of August 1, we feel the 1951 reports would have reflected actual production prospects much more accurately. Another important aspect which should be studied is the selection and training of crop reporters. Some strengthening of State offices may be necessary to accomplish this. (3) If it is apparent that improvements cannot be made that will provide acceptable accuracy in abnormal years without substantial additional appropriations, we would suggest that considerable experimental work should be completed in designing new procedures and estimating techniques before major increases in appropriations are considered. The accuracy of this kind of an estimate is almost wholly dependent upon the accuracy of the sample or the ability to detect, measure and correct the error in the sample. This is extremely difficult in a forecast. We believe that an extensive study to determine the optimum size of the sample, how it can best be obtained and evaluated would be most beneficial. An independent pilot operation conducted on a statewide basis in one or more States involving alternative techniques would seem to offer possibilities for improving the accuracy of the estimating process.

The council staff is available to assist in any way possible in attaining measures to improve crop estimates. If we can be of service to you or your subcommittee, we hope that you will feel free to call on us.

Very truly yours,

WM. RHEA BLAKE,
Executive Vice President.

STATEMENT BY J. S. RUSSELL, DES MOINES REGISTER AND TRIBUNE

My name is J. S. Russell and I am farm editor of the Des Moines Register and Tribune and editor of the Iowa Farm and Home Register, published at Des Moines, Iowa. I have been writing about crops in the Corn Belt for more than 26 years and specifically about corn crops in Iowa. My tenure as farm editor of the Register and Tribune has been continuous since December 1925, with the exception of about 3 years during World War II when I served first as an official of the Food Distribution Administration and the War Food Administration in Washington, D. C., while on leave of absence and later acted as managing editor of the Register and Tribune.

Since I do not see my way clear to accept the invitation of your committee to travel to Washington at my own expense to appear before the committee concerning itself with the crop-reporting set-up, I am taking this method of conveying some ideas which I believe would result in improvement of crop estimates for corn and other Corn Belt crops.

In the first place I am in sympathy with the problems of the crop-reporting service and recognize the ability and integrity of the men in the service, as I know many of them in Washington and in the various field offices of the Middle West.

On several occasions I have thought that the crop estimates on corn failed to be up to date in presenting a true picture of conditions especially in times of a cold, wet spring like that of 1951.

This was true also in 1946 and 1947, and I protested then to Secretary of Agriculture Clinton Anderson, Norris E. Dodd, and others of the Department of Agriculture that the reports were overly optimistic.

I made the same sort of suggestions in the summer of 1951 to Secretary Brannan and to O. V. Wells, Chief of the Bureau of Agricultural Economics.

My reason for doubting the accuracy of these reports was partly on the basis of personal observation, on talks with competent crop observers and because I felt that the effects of the wet spring and delayed planting and the abandonment of

acreage had not been fully taken into consideration. I am inclined to think that subsequent corrections in estimates in both 1947 and 1951 confirmed my skepticism as to the reports issued in the summer of these years of wet spring months in the Corn Belt.

Here are some suggestions which I think tend to explain the failure of the crop estimates to be as helpful as they could be and some ways in which they can and should be improved:

1. The crop reports when issued frequently are out of date by the time they reach the public. The July 1 report on corn in 1951 was not issued until July 11 and was an interesting contribution to the history of the period but did not reflect condition of the corn crop on July 11. The October corn crop report based on conditions of the first of the month but it was out of date because on October 10 a severe wind swept Iowa and blew down a lot of stalks already weakened by corn borers. The outlook was poorer than the report indicated. My contention is that the issuance of crop reports is still geared to the horse and buggy days instead of having been stepped up to the airplane, and the telegraph. I agree with the American Association of Agricultural Editors of which I am a member that the issuance should be stepped up to the fourth or fifth of the month. It must be remembered that the modern work week of 40 hours with time and a half for overtime contribute to this situation and it might cost more money to speed up the time of release.

2. Provision should be made for a survey of acreage between July 1 and early in December when the final report for the year is issued. It is my understanding that abandonment after July 1 was taken into account in compiling the estimates but the published data indicated about 3 million acres more corn in the United States throughout the season than was reported in the revised December report. I would further suggest that midmonth supplemental reports be issued on crops and in States where unusual conditions make this necessary to get a true and up-to-date picture of the crop outlook. This has been done in a few instances and the results issued rather promptly.

I'd like to see this done oftener and I urged the Department of Agriculture and the Crop Reporting Service to do it in July and August of 1951.

3. It seems to me that the Crop Estimating Service has been burdened with an unusually large number of reports many of which have little or no general interest and pertain to only a very limited extent to the purpose for which the service originally was set up. I realize that the egg and milk production, the condition of hops, snap beans, tangerines, and cranberries, wine grapes, mung beans, broomcorn, hemp, sour cherries, maple sirup, etc., may be exceedingly important to a few individuals, I believe that the issuance of some of these items of definitely limited and local interest might be held up for issuance a few days after the basic and major crops such as cotton, tobacco, wheat, corn, oats, soybeans, peanuts, rice, etc.

4. It seems fairly obvious that a better cross section of farm reporters and reporting is desirable as well as some observation by trained crop reporters in order to avoid the overestimates which occurred in 1951. This involves some refinement in the techniques of crop reporting which I am sure the folks in the Crop Reporting Service will be able to work out. It may be that selective reporting rather than the shotgun method might be an improvement. While this is in effect to some extent, I believe that post-card surveys may not in the returns indicate a true cross section.

5. My last point has to do with qualitative evaluation of crops as well as quantitative and I realize that the crop reporting service may have some difficulty in finding a satisfactory answer. An example is the high moisture content and low feeding value of the 1951 corn crop in the area west of the Mississippi River. In all probability the estimate of the 1951 crop may be revised further to reflect this quality factor. If there is some way to take account of this situation in reporting crops it would be most useful particularly in the fall of the year when the conditions of the corn can be ascertained—September to December.

Statement of J. Roger Wallace, Journal of Commerce, New York, on Cotton Crop Estimating

The experience of recent years has amply demonstrated the fallacy of dependence upon crop reporters alone for determination of changes in cotton acreages from year to year. The danger of shifting bias, with no hope of measurement, is enhanced by the Crop Reporting Board dependence upon farmers as correspondents. There are many people, such as cotton merchants, storekeepers, small

country bankers, etc., who know much more about the crops in their vicinities than do farmers and who have less bias. Pressures to increase or decrease acreages inevitably are reflected in correspondents' replies, with those from farmers showing the greatest degree of error.

Apparently, the only practicable method of determining the acreage under present-day conditions is through actual measurement of a small sample of the fields planted to cotton. It may be possible to readopt the use of the frontage meter in a limited way.

It well may be that the time-honored method of estimating the cotton crop through separate estimates of acreage and of yield will have to be abandoned in favor of some new method of estimating production directly from correspondents' data. In this connection, my own experience over several years is that most correspondents can give a quantitative indication of probable production in their vicinities as early as the end of July, such indication expressed as a relative. Like all indications, these must be corrected for weevil infestation and other factors.

The method now used by the Crop Reporting Board for estimating the crop directly in its August and September forecasts should be subjected to careful scrutiny by an unbiased group. It is my opinion that this method will not stand up under such an examination. As I see it, curvilinear, straight-line, and joint relationships have been forced into a common, meaningless medium via arithmetic multiplication. Offsetting errors in most years until 1951 resulted in this method appearing to give good results. Any method of estimating that shows spurious accuracy as a result of offsetting errors can give answers that are far out of line in some years when the errors are all in the same direction.

In this connection, it is not enough to compare the Crop Reporting Board's estimates of the total crop with the total ginnings. The real proof is to compare the estimates by States. When this test is applied, the accuracy of the estimates declines rapidly. This test is even harder on private estimates.

It is most essential to get a good acreage figure. If Congress will not appropriate sufficient funds to enable sample measurements to be made, the Crop Reporting Board probably will have to develop some new method of approach to estimating the crop. If a good acreage figure can be obtained, it then is essential to arrive at the best yield per acre estimates that can be made. Undoubtedly, data obtained from correspondents should be supplemented by data from actual field tests or analyses.

I have nothing but the most sincere respect for the members of the Crop Reporting Board. They are overworked and underpaid. The entire appropriation for the Board is miserably small, considering the importance of the work and the tremendous amount of money that is involved in the crops affected by the estimates.

At the same time, I feel that the Board has been something less than frank in admitting its mistakes to the public. We all make them and the Board does not have to be that sensitive. Covering up last year's acreage overestimate by blaming the tremendous drop in the crop estimates to bad weather is a case in point. If the Board is bound by law to adhere to its original acreage estimate from July 1 until December 1, then the law should be revised. A second acreage survey—of probable acreage to be harvested as compared with a year earlier—would be helpful.

I still am far from convinced, and probably never will be convinced, that most of the early overestimates of the 1951 crop were not due to overestimates of acreage. I still feel that the acreage in cultivation July 1, 1951, was between 26.5 and 27 million acres as against 27.9 in the final revised estimate of the Board and the original estimate of 29.5 million.

When we were talking about a 17.3 million bale crop in August and September, 1951, the actual indication was about 15.5 million. The prospect improved a little during September and then started downhill owing to bad weather.

From the standpoint of history alone, it is not too important just what the actual outlook was at any given time. But, in view of the fact that the 1952 and later crop estimates will be based on past observations in which 1951 data play an important part, uncorrected past errors become very important. They can hang us again.

In the hearings, much stress was placed on the small numbers of correspondents' replies. A low rate of return is normal. There is little to be gained by increasing the number of replies over an amount as large as the Board receives. Bias is not decreased by increasing the number of replies.

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